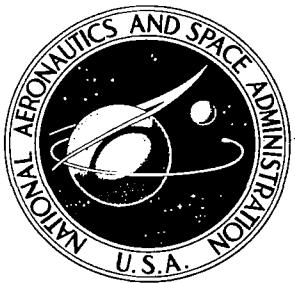


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OPTIMUM SOLAR ELECTRIC
INTERPLANETARY TRAJECTORY
AND PERFORMANCE DATA

by J. L. Horsewood and F. I. Mann

Prepared by

ANALYTICAL MECHANICS ASSOCIATES, INC.

Seabrook, Md.

for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • APRIL 1970

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OPTIMUM SOLAR ELECTRIC INTERPLANETARY TRAJECTORY
AND PERFORMANCE DATA

By J. L. Horsewood and F. I. Mann

1. Aeronautics

2. Space Probes

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SUMMARY

This report presents a comprehensive collection of optimum trajectory and spacecraft design data for unmanned interplanetary missions using solar electric propulsion. Data are presented for flyby and orbiter missions from Earth to Venus, Mars, Ceres, Jupiter, Saturn, Uranus, and Neptune and for flyby missions to Mercury. The planets are assumed to be in circular, coplanar orbits. For each mission, both direct and indirect flight modes are represented, and fully optimized trajectory data are given for missions using each of six launch vehicles. A constant jet exhaust speed solar electric propulsion system having a specific mass of 30 kg/kw is completely optimized in terms of power level and jet exhaust speed to yield maximum net spacecraft mass. The hyperbolic excess speeds at departure and arrival and the heliocentric travel angle are optimized for each mission. For orbiter missions, a chemical retro stage is used to brake the spacecraft into a highly eccentric capture orbit about the target planet.

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INTRODUCTION

This report presents the first reasonably comprehensive, though crude, solar-electric mission analysis of unmanned missions to the planets. It represents a culmination of the works of many others down through the years, without whose efforts in elucidating the various aspects of optimum trajectories and in improving numerical techniques this work would not have been possible. As it is not the purpose of this report to summarize these works, let it merely be mentioned in passing that an inkling of the effort which has gone into the science and engineering of low thrust rocketry may be obtained by perusing, for example, References 1, 2 and 3 which highlight, respectively, the analytic, the propulsion system hardware, and the computer software aspects of the subject. This report, which is concerned with only the most optimistic energy requirements (maximum net spacecraft mass) for solar-electric spacecraft, represents a significant step forward in the art of generating optimal electric propulsion trajectory data.

Missions Investigated

Data were generated for flyby and orbiter missions from Earth to Venus, Mars, Ceres, Jupiter, Saturn, Uranus and Neptune. Only flyby data were generated to Mercury, as the computer program encountered severe convergence difficulties in attempting to obtain orbiter data. These difficulties are thought to be at least partially due to the assumed solar power law. (The solar power law is explained in a later section.) For all orbiter missions, a chemical retro-stage performs an implicitly-optimal impulsive braking maneuver at the periapse of the capture orbit at a distance of 2 target-planet radii from the center of the target planet. The resulting capture orbit has an apoapse distance of 38 target-planet radii from the center of the target planet. Orbiter missions to Jupiter, Saturn, Uranus, and Neptune consist of two types, those in which the electric propulsion system is jettisoned prior to performing the retro maneuver, and those in which it is not.

The data generated correspond to open-angle transfers; that is, the total heliocentric travel angle is optimized to produce a local maximum of net spacecraft mass. Since there are, in general, several values of travel angle which produce such a local maximum, only the two solutions corresponding to the shortest flight times are considered. These are called Mode A and Mode B missions, corresponding to approximately $\frac{1}{2}$ and $1\frac{1}{2}$ revolutions around the sun, respectively. Both modes were investigated for all missions.

Six launch vehicles were considered for each mission: The SIC/SIVB/Centaur, the Titan III X(1207)/Centaur, the Titan III X(1205)/Centaur, the Titan III C, the Atlas (SLV3X)/Centaur, and the Titan III X/Centaur. This choice of launch vehicles covers a sufficient range to allow interpolation of the data for approximate estimations of

other launch vehicle capabilities.

The flight time was varied throughout an appropriate range to produce the family of trajectories of interest for each type of mission. This range was usually defined by the limits as net spacecraft mass varied between zero and its maximum value for a given mode and launch vehicle except in those instances where convergence difficulties prevented the generation of such a complete family of trajectories.

Many interesting missions were not considered in this study, principally due to the magnitude of effort involved in preparing this report as it stands. Missions which were originally intended for this report but which did not materialize on the computer consist of Mercury orbiters (mentioned above) and solar probe missions to 0.1 AU. Missions to Pluto were not considered because Pluto's orbital parameters are far from circular-ecliptic, and therefore such missions are highly dependent upon launch date at Earth. This is true also of missions to other highly interesting objects such as comets and nomad asteroids. All such missions which require an ephemeris of some sort and are sensitive to date at launch, have been set aside for later investigation. Extra-ecliptic missions, and missions to probe other interesting targets such as meteor streams and Trojan-point debris, are also beyond the scope of this study.

Spacecraft and Mission Parameters Presented

The quantities chosen for presentation consist of the initial and net spacecraft masses, the electric propulsion system and propellant masses, the retro-stage propellant mass (for orbiter missions only), the maximum and reference power levels, the thrust and jet exhaust speed, and the propulsion system total operating time. Also presented are the minimum and maximum solar distances, the heliocentric travel angle, the launch and arrival hyperbolic excess speeds, the retro-maneuver incremental speed (for orbiter missions only), and the initial Lagrange multipliers.

Method of Data Generation and Presentation

The software tool which generated the numerical results of this report is called TOPCAT. This computer program, summarized on p. 10 of Ref. 3 and further described in Ref. 4, has recently been greatly extended and improved by Analytical Mechanics Associates, Inc. at Seabrook, Maryland, making possible the rapid generation of strongly-converged optimal trajectories in large numbers. The accuracy of TOPCAT has been spot-checked by an independent source. Selected parameters defining each optimal trajectory are punched on cards by TOPCAT, and these cards are subsequently fed into a data-management and electronic-plotter computer program, which sorts and condenses the data before reading it onto magnetic tape. The resulting data tape, generated for this report, contains over 3,200 trajectory-summaries, representing all of the missions described above. The data tape is then fed back into the computer program, which electronically (SC4020) plots any desired subset

of the data, employing automatic scale-selection, curve-labelling, and graph-titling, and fitting a cubic spline with null end-moments (Ref. 5) through the discrete points contained on the tape. For example, all the plots in this report were generated in 7.2 minutes.

BASIC ASSUMPTIONS

Solar System Model

For the purpose of relating solar electric propulsion requirements to specific planetary destinations, the planets are assumed to travel in circular, coplanar orbits about the sun. The radii of the orbits are taken to be the semi-major axes of the real planetary orbits. These assumptions lead to performance estimates that essentially are average values of the cyclic variations in performance over several mission opportunities that are noted when the actual three-dimensional non-circular planetary ephemerides are employed. The planetary orbit radii employed in the trajectory computations are listed in Table I along with the mean radii and gravitational constants of the planets which are used in computing retro velocity increments.

Spacecraft Model

The initial mass of the spacecraft, m_o , is assumed to be comprised of five basic components. These are the propulsion system mass, m_{ps} , the low thrust propellant mass m_p and tankage mass m_t , the retro stage mass m_r , and the net spacecraft mass m_n . The terminology and nomenclature employed here conforms to the recommendations of Reference 6 as do the definitions of the systems and subsystems which together make up the individual basic components. The mass scaling laws are also as suggested in Reference 6 and are written

$$m_{ps} = \alpha P_{eo}$$

$$m_t = k_p m_p$$

$$m_r = m_i + m_{pr}$$

with

$$m_i = k_r m_{pr}$$

where P_{eo} is the electrical power to the thrust subsystem at one astronomical unit (AU) from the sun, α is the specific mass of the propulsion system, m_{pr} is the retro propellant mass, m_i is the retro stage inert mass, and k_p and k_r are scaling constants for the electric and retro propulsion systems, respectively. The values of the scaling constants used in generating the data presented here are given in Table II.

The propulsion system is assumed to operate at constant jet exhaust speed c with a thrust subsystem efficiency η given by

$$\eta = \frac{bc^2}{c^2 + d^2}$$

where c is expressed in kilometers per second. The variation of η with c is shown graphically in Figure 1 along with the assumed values of the constants b and d .

The electrical power input to the thrust subsystem varies with distance from the sun. This is due to the fact that the density of solar photons received by the solar cells varies approximately as the inverse square of the distance from the sun. However, because of the effect of temperature on the efficiency of solar cells, the variation of power with distance differs from the inverse square law. In fact, at distances well inside 1 AU, the cells, if unprotected, will be permanently damaged by excessive temperature, rendering them useless for the remainder of the mission. Based upon studies taking the effects of the space environment on solar cells into account, the following equation for power P_e at any solar distance r was recommended by

the Jet Propulsion Laboratory for use in this study:

$$P_e = P_{eo} \frac{1}{r^2} \sum_{i=0}^4 a_i r^{-i/2}$$

The power ratio, P_e/P_{eo} , is presented in Figure 2, along with the recommended values of the coefficients a_i . An interesting point to note in this figure is that the power ratio peaks with a value of about 1.4 at a solar distance slightly below 0.7 AU. At smaller solar distances the power ratio falls off abruptly and goes to zero at about 0.47 AU. Below this distance the power is assumed to be zero. Given the power P_e in kilowatts and the jet exhaust speed in kilometers per second, the thrust generated by the propulsion system is

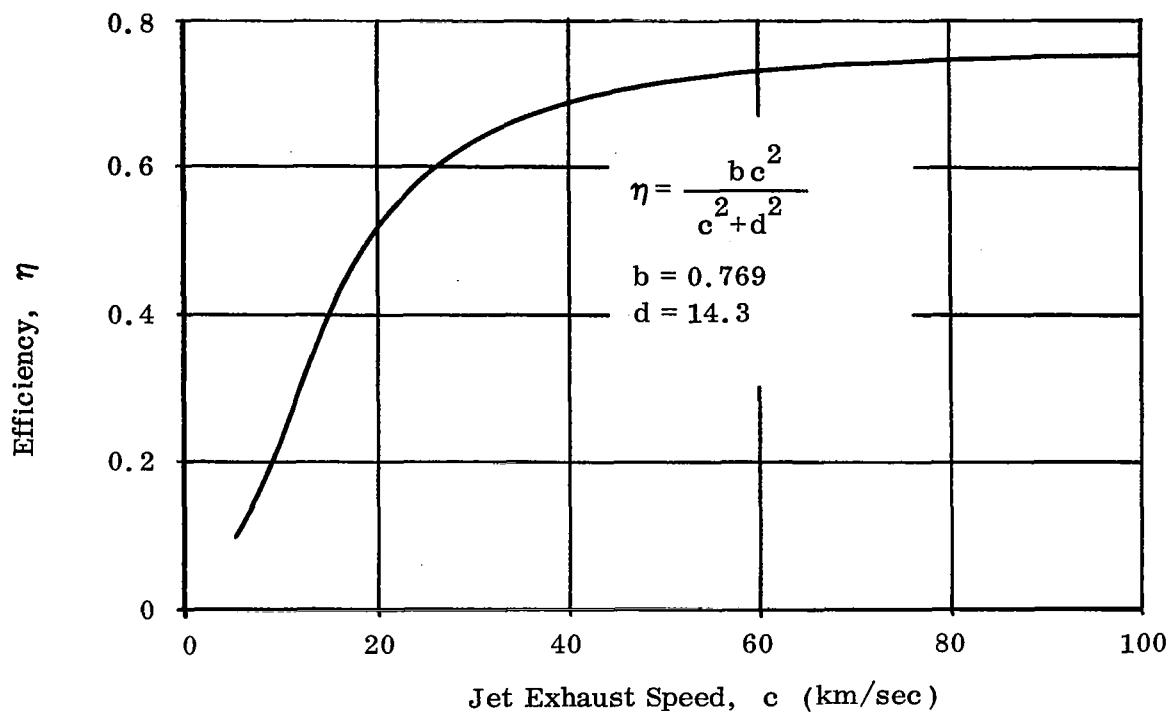


Fig. 1 — Propulsion system efficiency

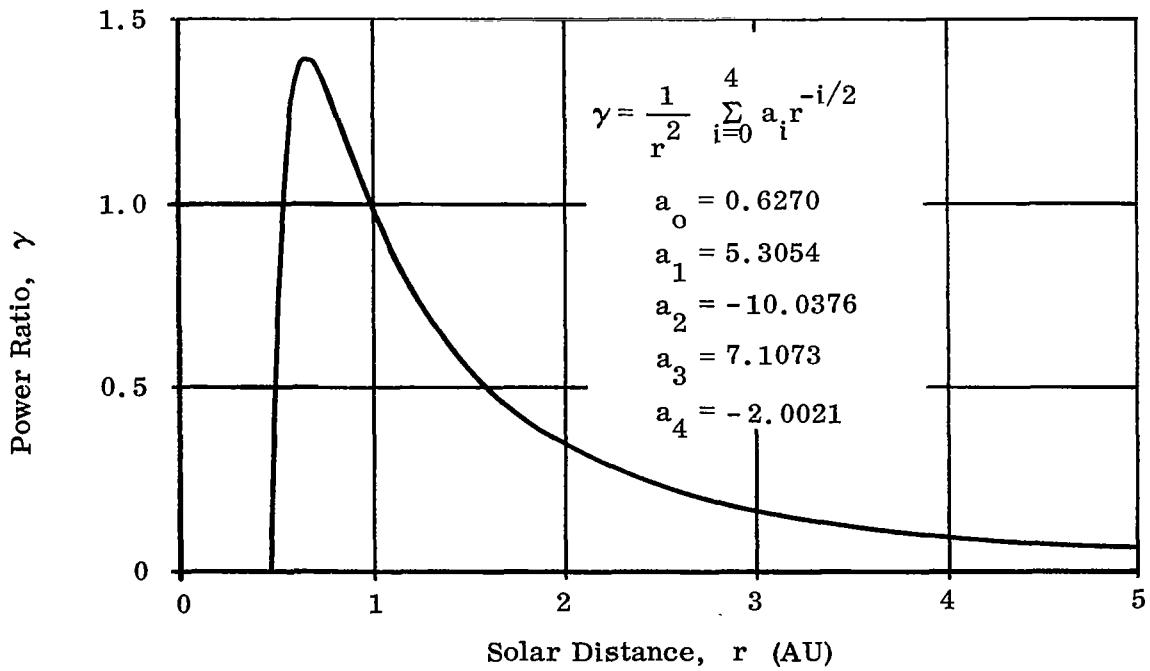


Fig. 2 — Power variation with solar distance

$$F = \frac{2\eta P_e}{c}$$

where F is the thrust in newtons. Since F is linear in P_e , the curve of Figure 2 also represents the variation in thrust as a function of solar distance.

The problem formulation employed in generating the numerical data is consistent with a spacecraft design which permits the gimbaling of the solar arrays relative to the thrust vector. Such a design is required to permit the thrust to be directed optimally while maintaining the plane of the solar array normal to the sun-spacecraft line. No constraints on the spacecraft attitude, such as may be required for directional antennas or star seekers, are included in the formulation.

Trajectory Model

The equations of motion employed in the generation of the numerical data are based on the assumption of two-body heliocentric motion and include the optimally directed thrust term plus the inverse square gravity term directed toward the sun. Solar pressure and other perturbing effects are not included. Denoting as \bar{r} the heliocentric position at any instant in time, the equations of motion are written

$$\ddot{\bar{r}} = \frac{a_0 \gamma}{\nu} \frac{\bar{\lambda}}{\lambda} - \frac{\mu}{r^3} \bar{r}$$

where γ is the power ratio

$$\gamma = P_e / P_{eo} ,$$

a_0 is the initial thrust acceleration evaluated at 1 AU

$$a_0 = \frac{2\eta P_{eo}}{m_0 c} ,$$

ν is the ratio of instantaneous to initial mass

$$\nu = m/m_0 ,$$

r is the magnitude of \bar{r} , μ is the gravitational constant of the sun, and $\bar{\lambda}$, with magnitude λ , is the well-known primer vector along which the thrust is optimally directed. The behavior of the primer vector will be discussed subsequently. The

mass ratio ν satisfies the first order differential equation

$$\dot{\nu} = - \frac{a_0 \gamma}{c}$$

The equations for \bar{r} and $\dot{\nu}$ are integrated numerically in a Cartesian coordinate system assuming the motion lies entirely in the x-y plane. For convenience, the initial position vector \bar{r}_0 is always aligned with the x-axis and has a magnitude of 1 AU, consistent with the assumption of departure from Earth. The initial velocity $\dot{\bar{r}}_0$ is set equal to the vector sum of the velocity of Earth and the hyperbolic excess velocity $\bar{v}_{\infty d}$. The velocity of Earth at the initial point is taken to be parallel to the y-axis, which is consistent with the assumption of circular, coplanar orbits; the magnitude of Earth's velocity, v_E , is evaluated using the standard conic equation

$$v_E = \sqrt{(\mu + \mu_E) / r_0}$$

where μ_E is the gravitational constant of Earth and $r_0 = |\bar{r}_0|$. The hyperbolic excess velocity is assumed to be provided by the specified launch vehicle. The assumed direction of this vector is along the primer vector, a choice which satisfies one of the necessary conditions of the calculus of variations. The magnitude of the excess velocity is directly related to the payload capability of the specified launch vehicle and, hence, to the initial mass of the spacecraft. Using a least squares routine, the payload capabilities of several launch vehicles were curve fit to an equation for the initial mass of the spacecraft of the form

$$m_0 = b_1 e^{-v_c/b_2} - b_3$$

where v_c is the characteristic speed defined by

$$v_c = \sqrt{v_{\infty d}^2 + 2v_{Ec}^2} - v_{Ec}$$

with $v_{\infty d} = |\bar{v}_{\infty d}|$, and v_{Ec} is the circular speed in a 185 kilometer altitude parking orbit about Earth. A set of coefficients b_1 , b_2 , and b_3 is required for each launch vehicle. Those used for the six vehicles included in this study are listed in Table III and yield m_0 in kilograms for v_c expressed in meters per second. The data employed in the least squares curve fits were taken from Reference 7.

TABLE I
PLANETARY CONSTANTS

	Gravitational Constant (km ³ /sec ²)	Orbit Radius (AU)	Planet Radius (km)
Sun	1.32718 x 10 ¹¹	-----	-----
Mercury	2.17562 x 10 ⁴	.3871	2500
Venus	3.24853 x 10 ⁵	.7233	6100
Earth	3.98603 x 10 ⁵	1.0000	6378
Mars	4.29778 x 10 ⁴	1.5237	3415
Ceres	2. x 10 ²	2.7673	390
Jupiter	1.26707 x 10 ⁸	5.2028	69880
Saturn	3.79179 x 10 ⁷	9.5388	57540
Uranus	5.78673 x 10 ⁶	19.1820	25500
Neptune	6.87631 x 10 ⁶	30.0577	25000

TABLE II
SPACECRAFT MASS SCALING CONSTANTS

Specific Propulsion System Mass, α (kg/kw)	Low Thrust Tankage factor, k_p	Retro Stage Inert Factor, k_r
30	0.03	0.11111

TABLE III
LAUNCH VEHICLE PAYLOAD COEFFICIENTS

	b ₁	b ₂	b ₃
SIC/SIVB/Centaur	721340.64	3221.5896	1317.1900
Titan III X(1207)/Centaur	204140.98	3556.4093	1610.6525
Titan III X(1205)/Centaur	144286.44	3668.7527	1680.2110
Titan III C	385417.36	2436.6746	1891.3260
Atlas (SLV3X)/Centaur	77360.130	3652.7918	1653.7180
Titan III X/Centaur	53329.556	3958.6734	1759.2682

Due to the assumption of open angle transfers, the target is permitted to be at any point in a circular orbit of radius equal to the semi-major axis of the specified target planet. The velocity of the target planet is assumed to be perpendicular to the final heliocentric radius vector in the plane of motion with a magnitude

$$v_T = \sqrt{(\mu + \mu_T) / r_f}$$

where μ_T is the gravitational constant of the target planet and r_f is the final heliocentric distance and radius of the target planet's orbit. The final spacecraft velocity is unconstrained for flyby missions; however, for orbiter missions it is permitted to differ from the target planet's velocity by an amount $\bar{v}_{\infty a}$ which is the arrival hyperbolic excess velocity. It is assumed that a chemical retro stage, with a specific impulse of 300 seconds and propellant mass fraction of 0.9, is employed to brake from the resultant hyperbolic planetocentric orbit to an elliptic capture orbit with periapsis and apoapsis distances of 2 and 38 planetary radii, respectively. The impulsive thrust retro maneuver is assumed to take place at periapsis of the approach hyperbola; hence, the incremental speed of the retro maneuver is

$$v_r = \sqrt{v_{\infty a}^2 + \frac{2\mu_T}{r_{Tp}}} - \sqrt{\frac{2\mu_T r_{Ta}}{r_{Tp}(r_{Ta} + r_{Tp})}}$$

where $v_{\infty a} = |\bar{v}_{\infty a}|$ and r_{Ta} and r_{Tp} are the planetocentric apoapsis and periapsis distances, respectively. The vector $\bar{v}_{\infty a}$ is assumed to lie diametrically opposed to the final primer vector, a condition dictated by the necessary conditions of the calculus of variations. The chemical retro stage propellant requirements are evaluated using the familiar sizing law

$$m_{pr} = m_o \nu_f (1 - e^{-v_r/c_r})$$

where ν_f is the mass ratio at the end of the heliocentric maneuver (i.e., $m_o \nu_f = m_o - m_p$), and c_r is the jet exhaust speed of the retro stage ($= g_o I_{sp} = 2941.995 \text{ m/sec}$). The use of this equation implies that the low thrust propulsion system is carried into the final orbit along with the net spacecraft mass. For orbiter missions to the outer planets there is little or no purpose in retaining the propulsion system in the final orbit since the power that can be generated by the solar arrays at such large distances from the sun is extremely small. Since the retro propellant requirement is directly proportional to the mass of the spacecraft at the start of the maneuver, it is advisable, from the standpoint of maximizing the net spacecraft

mass, to jettison as much unnecessary mass as possible prior to ignition. For this reason data were generated for the outer planet orbiter missions assuming the low thrust propulsion system mass m_{ps} and tankage mass m_t are jettisoned prior to the retro maneuver. Under this assumption the retro propellant mass is computed

$$m_{pr} = (m_o \nu_f - m_{ps} - m_t) (1 - e^{-v_r/c_r})$$

For comparison, outer planet orbiter data are also presented for the case in which the two mass components m_{ps} and m_t are carried into the final orbit.

Optimization Method

The application of the calculus of variations or the Pontryagin Maximum Principle to a specific optimization problem yields a set of conditions, known as Necessary Conditions, which the solution of the problem must satisfy. The technique of searching for a solution that satisfies all of the Necessary Conditions, as opposed to directly increasing or decreasing the performance index, is known as the indirect method of optimization. The indirect method was employed in generating the numerical data presented here.

Of primary importance in the indirect method are the adjoint variables, or Lagrange multipliers. The primer, which was mentioned earlier, represents three of these multipliers and is the vector that is adjoint to the heliocentric velocity vector. The time derivative of the primer is directly related to three other multipliers, being the negative of the adjoint to the position vector. One additional multiplier, λ_ν , the adjoint to the mass ratio, is required for the solution of the low thrust trajectory. The behavior of these variables is governed by the familiar Euler-Lagrange equations,

$$\ddot{\lambda} = \frac{a_o \gamma^*}{\nu r} \sigma \bar{r} - \frac{\mu}{r^3} \bar{\lambda} + \frac{3\mu}{r^5} (\bar{r} \cdot \bar{\lambda}) \bar{r}$$

$$\dot{\lambda}_\nu = \frac{a_o \gamma}{\nu^2} \lambda$$

where γ^* denotes the derivative of the power ratio γ with respect to r and σ is, for reasons to be made clear shortly, termed the switch function and is defined

$$\sigma = \lambda - \frac{v}{c} \lambda_v$$

During coast phases, $\dot{\lambda}_v$ and the first term in the equation for $\ddot{\lambda}$ are zero.

The problem at hand is that of selecting the optimum thrust direction and the appropriate times for switching the low thrust propulsion system on and off so as to maximize the net spacecraft mass for a specific interplanetary flyby or orbiter mission. It is also desired to optimize the propulsion system parameters a_o and c as well as the distribution of energy supplied by the launch vehicle, the low thrust propulsion system, and, for orbiter missions, the chemical retro stage. The following Necessary Conditions are required to hold on converged trajectories:

- (1) The optimal thrust direction is along the primer vector, a result employed previously in writing the equations of motion.
- (2) The engine is on if σ is positive and off if σ is negative, hence the terminology "switching function."
- (3) The multipliers are continuous at switching points and throughout the mission.
- (4) Because the travel angle is left open, the condition

$$|\dot{\bar{r}} \times \dot{\bar{\lambda}} - \bar{r} \times \dot{\bar{\lambda}}|_{t_f} = 0$$

must be satisfied where t_f denotes final time. This is known as the transversality condition associated with travel angle.

- (5) Because the engine parameters a_o and c are left open, the transversality conditions

$$\frac{m_{ps}}{a_o} \left[1 - j_{ps} (1+k_r) (1-e^{-v_r/c_r}) \right] + \lambda_{a_o} = 0$$

$$m_{ps} \left(\frac{1}{c} - \frac{\eta^*}{\eta} \right) \left[1 - j_{ps} (1+k_r) (1-e^{-v_r/c_r}) \right] + \lambda_c = 0$$

must be satisfied, where j_{ps} is one if the propulsion system is jettisoned

prior to capture and zero otherwise, η^* is the derivative of propulsion system efficiency with respect to jet exhaust speed, and λ_{a_0} and λ_c are defined

$$\lambda_{a_0} = - \int_{t_0}^{t_f} \frac{\gamma}{\nu} \sigma dt ; \quad \lambda_c = - \int_{t_0}^{t_f} \frac{a_0 \gamma}{c^2} \lambda_\nu dt$$

with the integrands being zero during coast phases. For flyby missions the second term within the square brackets of each of the two conditions vanishes because the quantity $(1-e^{-v_r/c_r})$ is zero.

(6) Because the hyperbolic excess speeds $v_{\infty d}$ and $v_{\infty a}$ are left open, the following two transversality conditions must be satisfied

$$\frac{m_n}{m_0} m_0^* + \lambda(t_0) = 0$$

$$\frac{1}{c_r} \frac{v_{\infty a}}{\sqrt{\frac{v_{\infty a}^2}{2} + \frac{r_{Tp}}{r}} (1+k_r)} (m_0 \nu_f - j_{ps} m_{ps} - j_t m_t) e^{-v_r/c_r} - \lambda(t_f) = 0$$

where m_0^* is the derivative of initial mass with respect to $v_{\infty d}$ and j_t is equal to one if the tankage is jettisoned prior to capture and zero otherwise. The latter of the two conditions applies only for orbiter missions.

(7) Because the directions of the departure and arrival excess velocities are left open, the Necessary Conditions require that $\bar{v}_{\infty d}$ be directed along $\bar{\lambda}$ at the initial time t_0 , and that $\bar{v}_{\infty a}$ be directed opposed to $\bar{\lambda}$ at the final time. The condition pertaining to the direction of $\bar{v}_{\infty a}$ is applicable only for orbiter missions.

(8) For flyby missions the performance index is not an explicit function of the final excess speed; consequently, since the final velocity is completely free, the Necessary Conditions yield the following vector transversality condition,

$$\bar{\lambda}(t_f) = \bar{0}$$

where $\bar{0}$ is the null vector.

(9) Because the final mass ratio is left open, the following transversality equation arises

$$m_0 \left[(1+j_t k_t) (1+k_r) (1-e^{-v_r/c_r}) - (1+k_t) \right] + \lambda_\nu(t_f) = 0$$

Note that the first term in the square brackets vanishes for flyby missions.

The problem remaining is that of guessing the initial values of the Lagrange multipliers and the unspecified parameters a_0 , c , $v_{\infty d}$, and $v_{\infty a}$ that satisfy the specified boundary conditions and the appropriate transversality conditions. For the (two-dimensional) problem under consideration there are five unknown initial multipliers (the components of the primer and its time derivative normal to the plane of motion are identically zero) for a total of nine independent parameters, and there is an equal number of boundary and transversality conditions that are to be satisfied. This would constitute a ninth order boundary value problem were it not for the fact that the Euler-Lagrange equations are linear and homogeneous in the multipliers. Such equations have the property that if there exists the solution $[\bar{\lambda}, \ddot{\lambda}, \lambda_\nu]$, then $[k\bar{\lambda}, k\ddot{\lambda}, k\lambda_\nu]$ is also a solution where k is an arbitrary nonzero constant. This permits fixing the initial value of one of the multipliers, thereby reducing the order of the boundary value problem by one. In generating the data presented herein, this property was employed by always setting the initial value of the mass ratio multiplier λ_ν equal to unity. Of course, any term in the transversality conditions that contains a Lagrange multiplier must be scaled accordingly. This is accomplished by replacing the multiplier in the condition with the product of the multiplier and the arbitrary scaling constant k . The setting of $\lambda_\nu(t_f)$ to unity is equivalent to selecting the value of k . This value is obtained by solving the last transversality condition above for k after making the substitution of $k\lambda_\nu(t_f)$ for $\lambda_\nu(t_f)$. This yields

$$k = \frac{m_0}{\lambda_\nu(t_f)} \left[(1+k_t) - (1+j_t k_t) (1+k_r) (1-e^{-v_r/c_r}) \right]$$

where $\lambda_\nu(t_f)$ is the final value of λ_ν resulting from the unit initial condition. The appropriate choices of the Cartesian components of the initial primer and its derivative are presented in the data which follow and correspond to an initial mass ratio

multiplier equal to one. The values shown are predicated on the additional assumption that the unit of distance is the astronomical unit, the unit of time is that required for a particle of negligible mass to travel one radian in a circular orbit of 1 AU radius about the sun, and the unit of mass is the kilogram.

It is a well known fact that a solution to a particular optimization problem may not be unique. That is, more than one valid solution may satisfy the Necessary Conditions, such as the two trajectory profiles termed Mode A and Mode B which arise for open-angle transfers. Furthermore, nonvalid solutions may exist in which the net spacecraft mass is maximized as a function of some independent variables and is minimized as a function of the remaining independent variables. These saddle point solutions pose problems for the analyst because the transversality conditions cannot distinguish between them and the purely maximizing solutions. Instances were uncovered in the generation of the numerical data in which saddle point solutions existed in the proximity of the local optimum solution. Unless a costly second-variation technique is employed, it is very difficult, if not virtually impossible, to assure that only solutions that are genuinely maximizing in net spacecraft mass are obtained.

PRESENTATION FORMAT

Order of Presentation

The numerical results are presented in graphical form and are ordered according to ascending figure number, Fig. a.b.c., where a, b, and c are integers: a assumes values one through eight, corresponding to Mercury, Venus, Mars, Ceres, Jupiter, Saturn, Uranus, or Neptune, respectively; b assumes values one through six, corresponding to (1) Mode A flybys, (2) Mode B flybys, (3) Mode A orbiters without jettisoning, (4) Mode A orbiters with jettisoning, (5) Mode B orbiters without jettisoning, and (6) Mode B orbiters with jettisoning, where jettisoning refers to the discarding of the solar-electric propulsion system prior to entering the capture orbit about the destination planet; c assumes values one through six, corresponding to the launch vehicles SIC/SIVB/Centaur, Titan III X(1207)/Centaur, Titan III X(1205)/Centaur, Titan III C, Atlas(SLV3X)/Centaur, and Titan III X/Centaur, respectively. Each figure, therefore, represents a given class of missions, having a given destination planet, and using a given launch vehicle. The destination, launch vehicle, and mode also appear explicitly in the title, directly to the right of the figure number.

Basic Layout

Each figure consists of four graphs, each having the flight time as independent variable. Two graphs are situated on each of two opposing pages so that all pertinent

information for a given set of missions is available at a glance. Each curve is lettered, the letter-code being given at the top of each figure.

The first graph (upper left) presents the mass breakdown of the vehicle, in kilograms. This consists of (A) the net spacecraft mass, more commonly known as payload, (B) the initial spacecraft mass, which is equivalent to the payload of the launch vehicle, (C) the propulsion system mass, (D) the low-thrust propellant mass, and (E) the propellant mass of the retro-stage, which is present for only orbiter missions.

The second graph (lower left) presents the parameters which characterize the solar-electric propulsion system, and also the maximum power encountered along each trajectory and the total power-on time of the solar-electric propulsion system. These consist of (F) the propulsion system reference power (power at one astronomical unit from the sun), in kilowatts, (G) the maximum power which is required of the solar-electric propulsion system as the spacecraft travels along its optimum trajectory, in kilowatts, (H) the solar-electric propulsion system jet exhaust speed, in meters per second, (I) the spacecraft thrust at one astronomical unit from the sun, in newtons, and (J) the total low-thrust propulsion time, in days.

The third graph (upper right) presents the basic parameters which characterize an interplanetary trajectory. These consist of (K) the maximum distance which the spacecraft recedes from the sun, in astronomical units, (L) the closest approach which the spacecraft makes to the sun, also in AU, (M) the total angle through which the spacecraft travels around the sun from the earth to its destination, in degrees, (N) the hyperbolic excess speed of the spacecraft at earth departure, in meters per second, (O) the hyperbolic excess speed of the spacecraft at the destination planet, in meters per second, and (P) the incremental speed performed by the retro-stage at the periapse of the capture orbit, in meters per second, and which is present for only orbiter missions.

The fourth graph (lower right) presents the four initial Lagrange multipliers which are required to start a given optimum trajectory. Their magnitudes correspond to an initial mass-ratio Lagrange multiplier which is normalized to unity. For the performance index of maximum net spacecraft mass, the primer has units kilogram-tau/AU and its derivative has units kilogram/AU, where tau is the normalizing unit of time defined previously.

Standardization of Scales

Due to the wide range of magnitudes among the many parameters which are plotted, it was deemed necessary to choose standard scales for the ordinates of the four graphs. This in turn requires the presence of scaling factors for each curve (assumed to be unity when not present), which appear, following a slash (/), with the letter-code above each figure. These scaling factors are very easy to interpret;

for example, if a quantity has an apparent value of 4 and a scaling factor of 1000, then its true value is 4 times 1000, or 4000.

The scale factor selection was performed automatically by the electronic-plotter computer program. The selection algorithm allowed a given curve to exceed the upper and lower ordinate bounds of each graph by up to ten percent of the respective maximum upper or lower value which may be plotted. Therefore, in a few instances, most of a curve will lie, for example, above the graph (and hence is not plotted), but this unplotted portion of the curve must lie entirely within 110% of its maximum plotted value, which is usually sufficient information. This ten-percent-condition is violated only for a few Lagrange multiplier curves corresponding to missions with flight times of less than 100 days, when the multipliers become rapidly varying and increase severely in magnitude. For these cases, the scaling factor was not allowed to exceed unity, so that the rapidly varying portions of the curves lie partially beyond the ordinate bounds, permitting the remainder of the curves to be plotted reasonably.

Curve Labelling

The labelling of each curve with a letter-code was also performed automatically by the electronic-plotter computer program, and exhibits some weaknesses. The possibility of overplotting of letters, which may render them unrecognizable, is the basic weakness of the labelling algorithm. This possibility is due to the absence of a "memory" in the automatic-labelling routine. Such a memory was considered unnecessary since each curve is tagged with a letter at both endpoints, and the probability of a double-overlap is negligible except for the reference power (F) and maximum power (G) curves, which frequently coincide. For these two curves, a special, limited memory prevents the overlap of their code-letters.

Regions of Vanishing Optimum Power

For the great majority of trajectories, the optimum reference power of the solar-electric spacecraft is greater than zero, and the corresponding curves consist of solid lines. For some Mercury, Venus, and Mars missions, however, the optimum reference power is identically zero for certain ranges of flight time, and the corresponding curve-segments consist of dashed lines. The solar-electric propulsion system is totally absent for such zero-power, or ballistic, missions. The flight times at which the reference power first becomes zero (that is, the boundaries of the ballistic regions) are obtained by a linear extrapolation of the reference power to zero, using the two nearest available points. Function values at the boundaries of ballistic regions are also obtained by linear extrapolation. The quantities denoted by letter codes C, D, F, G, and I are identically zero in ballistic regions; those denoted by letter codes H, J, Q, R, S, and T are undefined; those denoted by A and B are coincident for flybys.

DISCUSSION OF NUMERICAL RESULTS

In the discussions which follow, a capital letter enclosed in parentheses () refers to the letter-code associated with a given plotted quantity..

A cursory glance at any of the initial Lagrange multiplier plots reveals that the x-component of the initial primer (Q) is apparently equal to the negative y-component of the initial primer derivative (T). This follows by linking the open-angle transversality condition (at the final time)

$$\bar{\lambda}_f \times \dot{\bar{r}}_T - \dot{\bar{\lambda}}_f \times \bar{r}_f = \bar{0}$$

to the initial conditions by means of the well-known constant of the motion,

$$\bar{\lambda} \times \dot{\bar{r}} - \dot{\bar{\lambda}} \times \bar{r}$$

and the heliocentric boundary conditions,

$$\dot{\bar{r}}_o = \dot{\bar{r}}_E + v_{\infty d} \frac{\bar{\lambda}_o}{\bar{\lambda}_o}$$

$$\dot{\bar{r}}_f = \dot{\bar{r}}_T + v_{\infty a} \frac{\bar{\lambda}_f}{\bar{\lambda}_f}$$

and the identity $\bar{\lambda} \times \bar{\lambda} = \bar{0}$. Since, for this report, the z-components of $\bar{\lambda}$ and $\dot{\bar{\lambda}}$ are zero, $\bar{r}_E = (1, 0, 0)$, and $\dot{\bar{r}}_E \cong (0, 1, 0)$, the approximation being due to the fact that the Earth's speed is actually slightly greater than unity, as given by a previous equation, the desired result follows after simple substitution.

Two quantities which, perhaps among others, follow a basic trend, are the net spacecraft mass (A) and the heliocentric travel angle (M). The former will pass through zero for a sufficiently small flight time, and will generally have a maximum for some greater flight time, while the latter will, in general, monotonically increase with flight time.

A corner in a propulsion time curve (J) reflects the appearance or disappearance of a coast phase along the trajectory. Figures 5.4.5 and 7.4.6 provide examples of such corners, for trajectories containing coast phases, while Figures

7.3.2 and 7.4.1 provide examples of missions having no coast phases for a range of flight times.

For many Mode B missions, the minimum solar distance (L) will be unity (corresponding to the launch at Earth) for greater flight times and will dip below unity for smaller flight times, such as in Figures 5.2.1, 5.5.3, and 7.6.4. These two segments of the minimum solar distance curve will be separated by a corner, even though the spline fit will tend to smooth the corner out or even oscillate slightly there, such as in Figure 5.2.6, jutting above unity, which obviously cannot occur for launch from Earth. Corners will appear in other curves, notably in the maximum power (G), which splits away from the reference power (F). This in turn tends to cause corners in the jet exhaust speed (H), the thrust at 1 AU (I), and the propulsion system mass (C), and may even cause the propulsion time (J) to rise or drop slightly.

For many Mode A missions to the nearby planets, the (optimum) power at 1 AU (F) is identically zero for a range of flight times, as in Figure 1.1.1. Figure 2.1.4 provides an example where the power does not quite vanish, indicating the continuous nature of the vanishing-power tendency. In addition to the comments on these ballistic regions mentioned in the Presentation Format section, the quantities arrival excess speed (O), retro incremental speed (P), and retro propellant mass (E) will in general have corners at the boundaries of ballistic regions. In several instances, such as in Figure 2.3.6, the power tends to vanish near the Hohmann transfer (heliocentric travel angle (M) equal to 180°), where the above-mentioned quantities (O), (P), and (E) have minima.

This report falls slightly short of the originally planned comprehensiveness, due mainly to convergence difficulties with the computer program. Mercury orbiter missions are absent for reasons mentioned in the Introduction. Convergence trauma prevented obtaining much Ceres Mode B orbiter results, and caused other sporadic cases to be brief, such as in Figure 8.2.1. The particular Ceres Mode B orbiter mission depicted by Figure 4.5.3 has curves whose first halves (smaller flight times) erroneously represent Mode A missions. Many curves may appear to be brief for intended reasons, such as lack of interest in large flight times or preference of Mode A over Mode B (or conversely) for a given flight time when the former's net spacecraft mass is greater.

A few quirks in the plotting algorithm, the cubic spline fit, turned up in the considerable amount of data plotted. In particular, curves (B), (E), and (N) of Figure 3.3.4 should be smooth, curve (N) of Figure 3.3.6 should not have a bump, and the wiggles in the Lagrange multipliers at about 450 days in Figure 5.1.4 should be ignored. Other such minor plotting anomalies may exist, but these are of no serious consequence.

CONCLUDING REMARKS

The basic accomplishment of this report is to provide both the mission analyst and the spacecraft designer with a sufficiently wholesome glimpse of solar-electric mission possibilities to allow the formulation of meaningful decisions regarding a more sophisticated and realistic approach to the problem. The existence of a data tape containing all of the information in this report implies that the process of studying this report to reach deeper conclusions concerning solar-electric mission characteristics could easily be automated by the computer. Answering basic questions such as, for example, "What are all the missions within the solar system which can be performed, given a (1) range of payloads, (2) range of reference power levels, (3) range of maximum power levels, or (4) maximum propulsion time?" can be accomplished in a few minutes by computer.

Work remaining to be done includes obtaining data for Mercury orbiter missions and other missions, mentioned in the Introduction, which have not been mapped; remapping the gamut of missions employing updated basic assumptions; and sensitivity studies using this report as the reference point. All of this will ultimately lead to the consideration of missions having realistic constraints, such as communications pointing and thrust orientation limits; of more complicated missions, such as those including swingby of an intermediate planet; and of more realistic models, including an n-body formulation, error analyses, and closed-loop simulations.

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NUMERICAL RESULTS

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

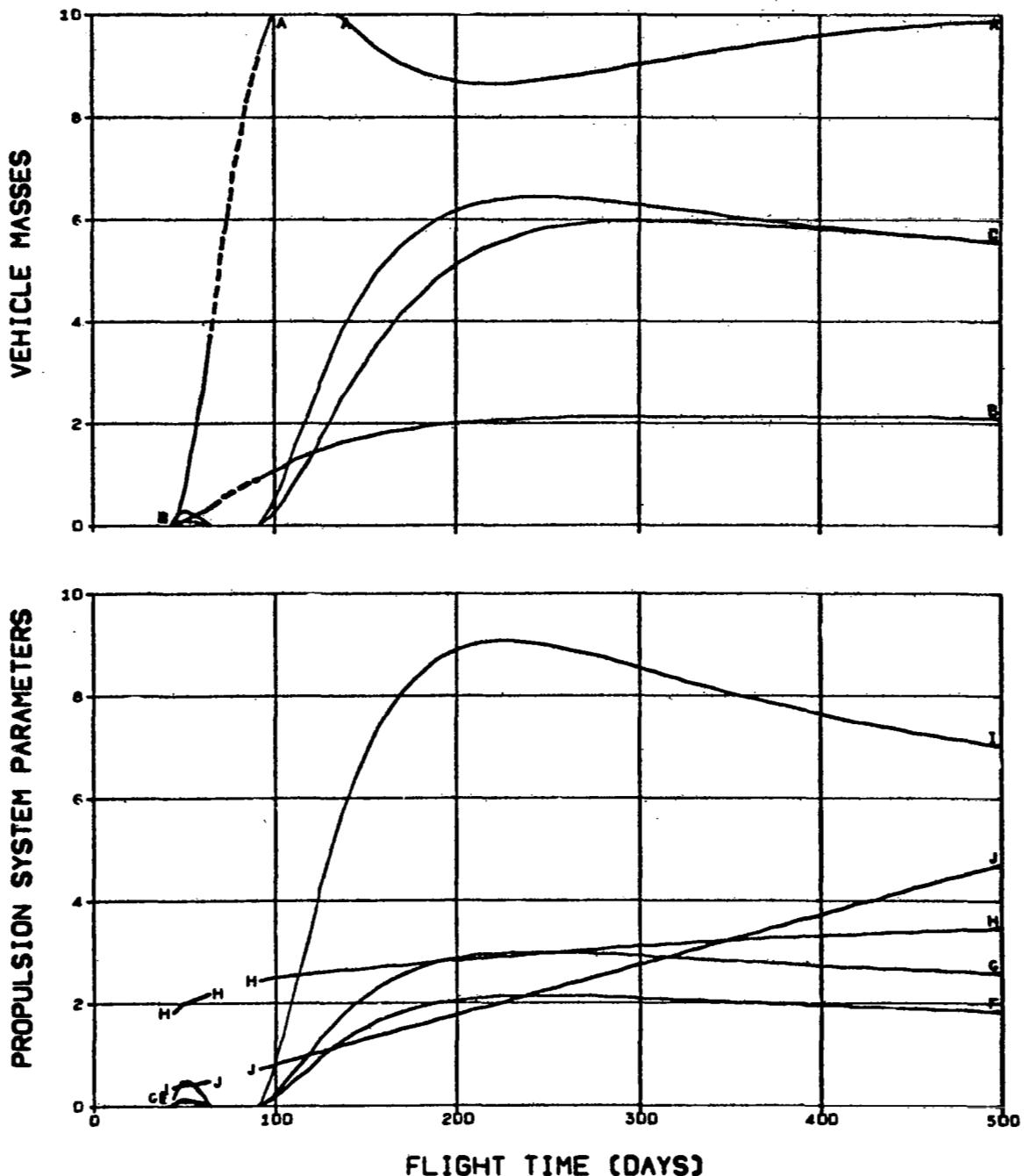


FIG. 1.1.1 MERCURY MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

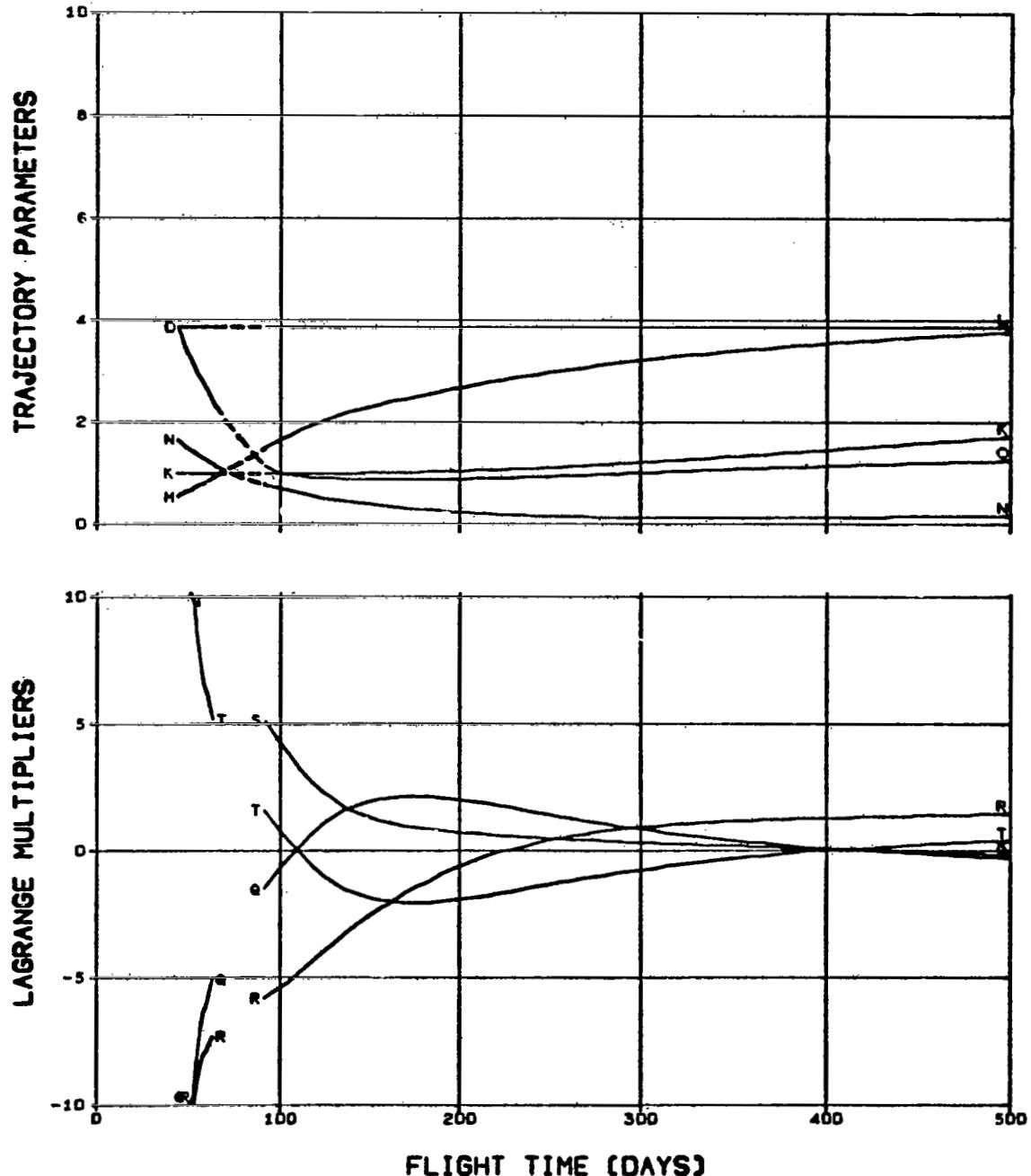


FIG. 1.1.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

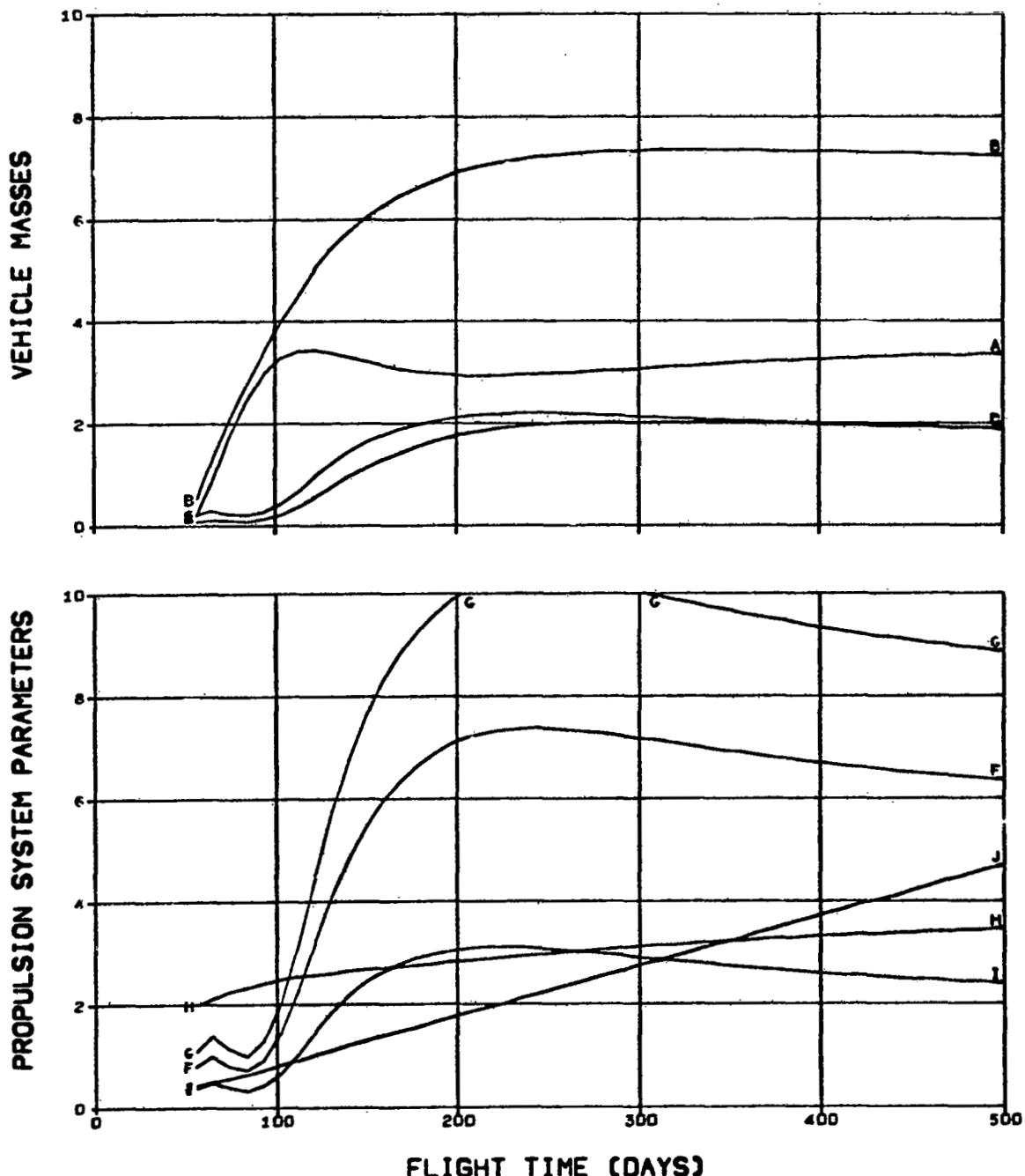


FIG. 1.1.2 MERCURY MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

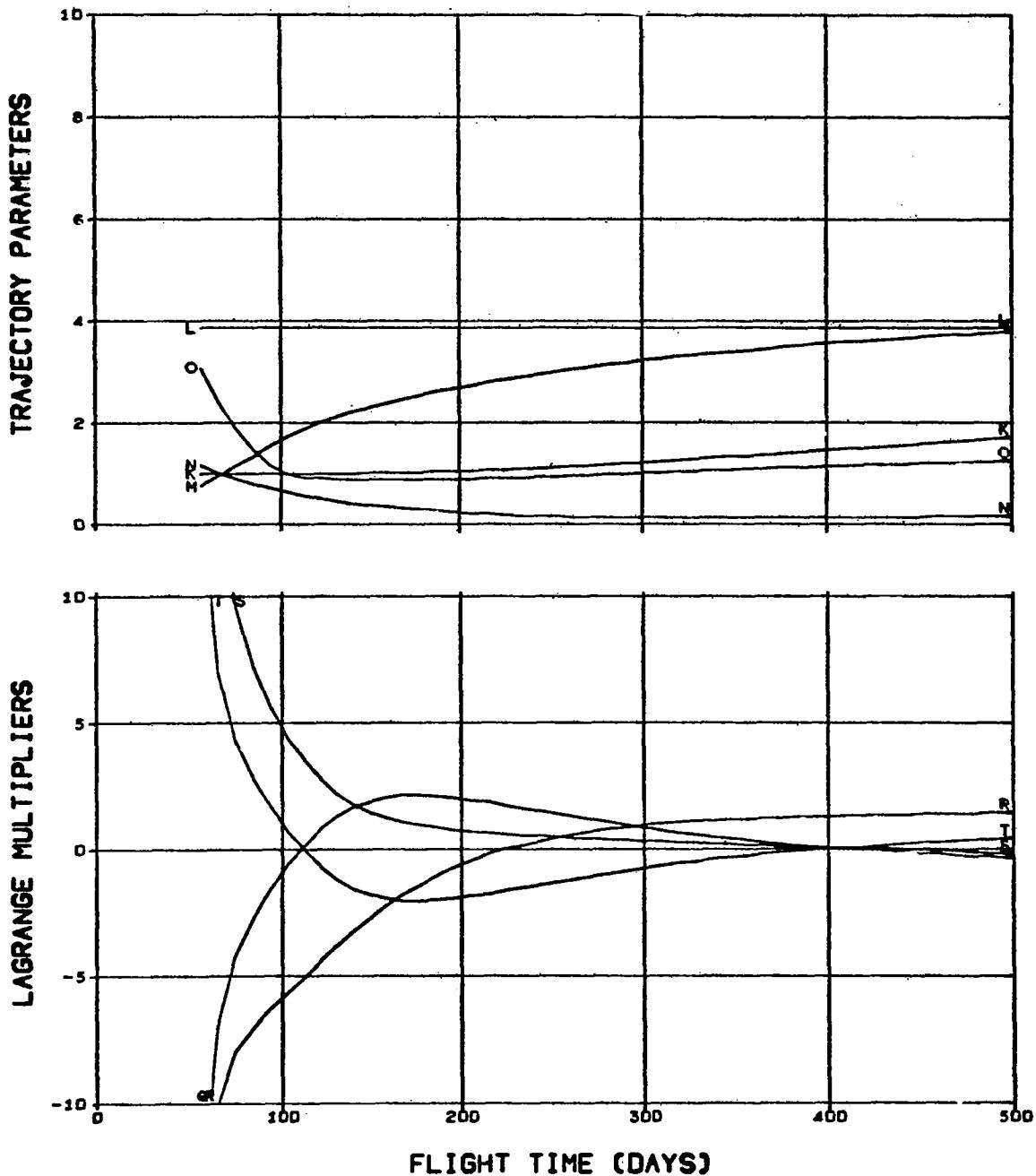


FIG. 1.1.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/1000	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
	J PROPULSION TIME (DAYS)/100

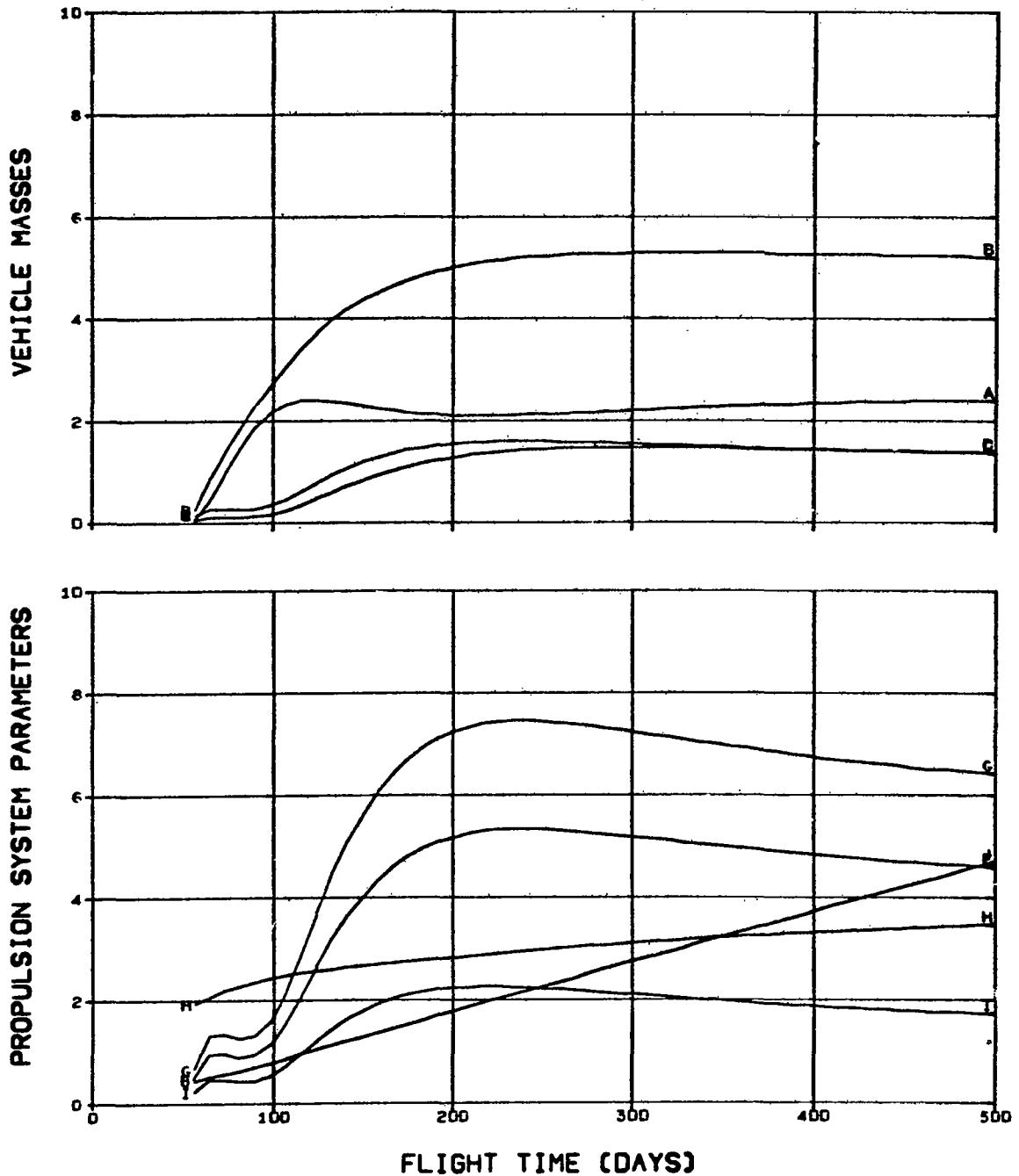


FIG. 1.1.3 MERCURY MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100000		

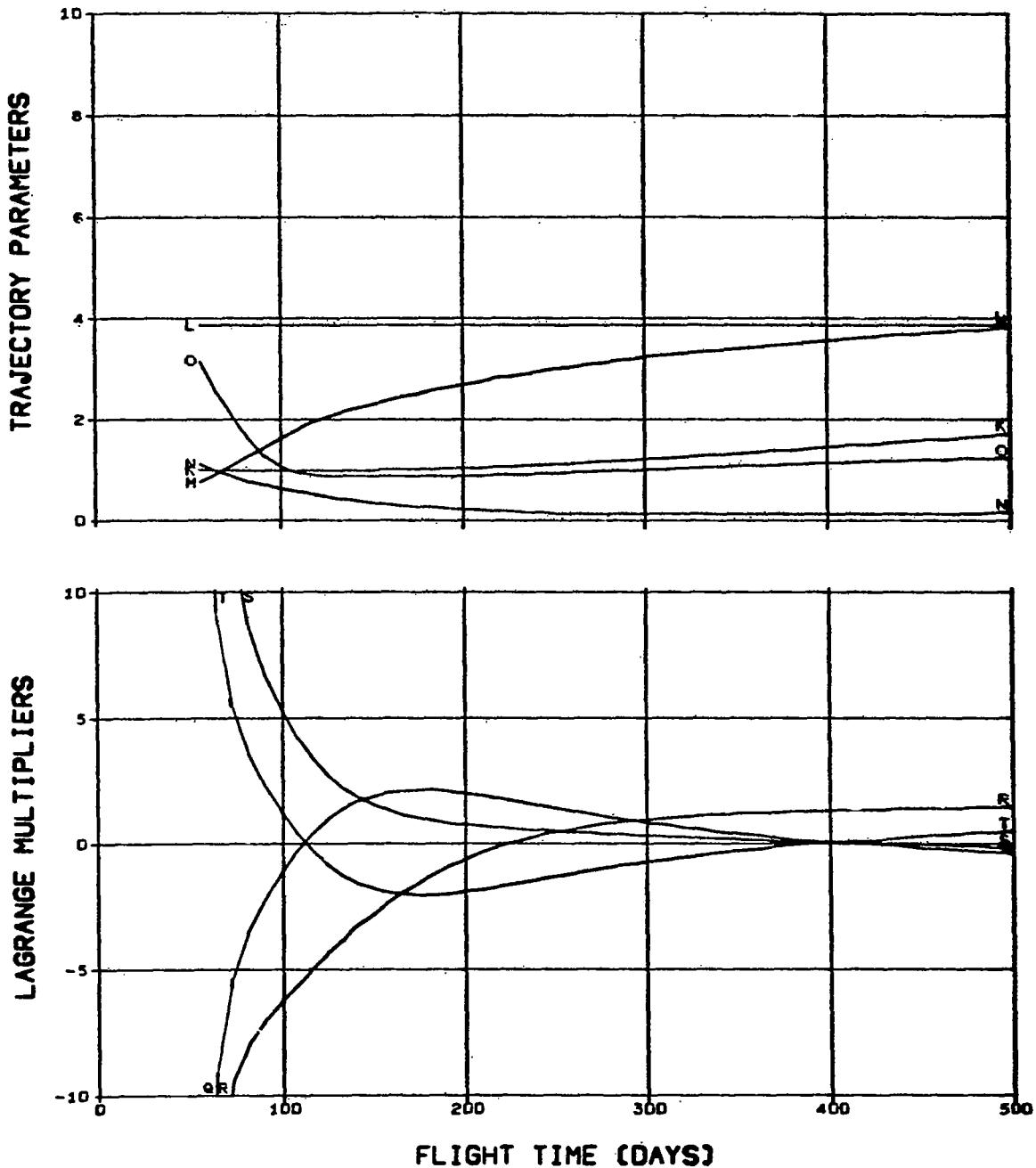


FIG. 1.1.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLUTION TIME (DAYS)/100

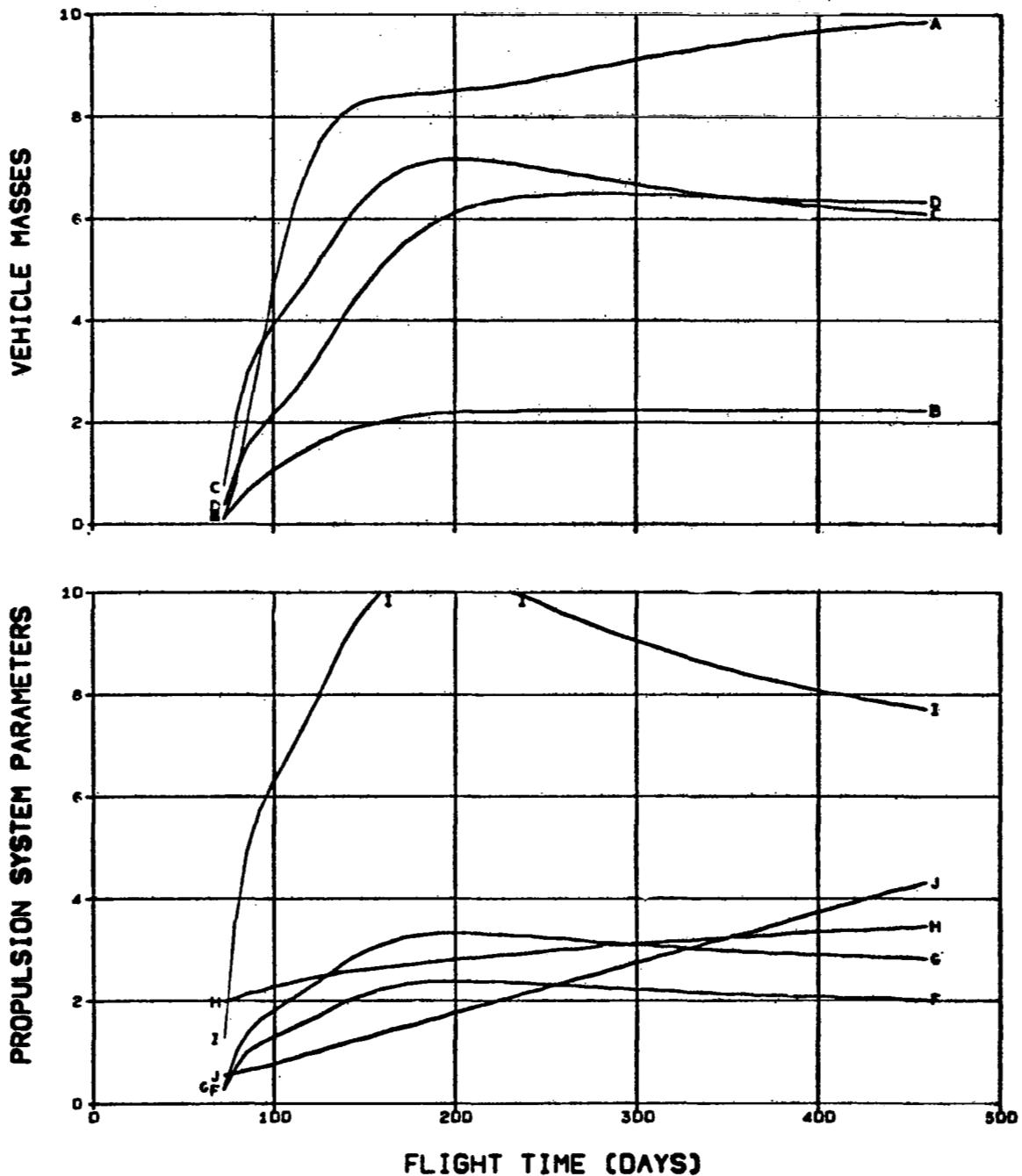


FIG. 1.1.4 MERCURY MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.DDE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

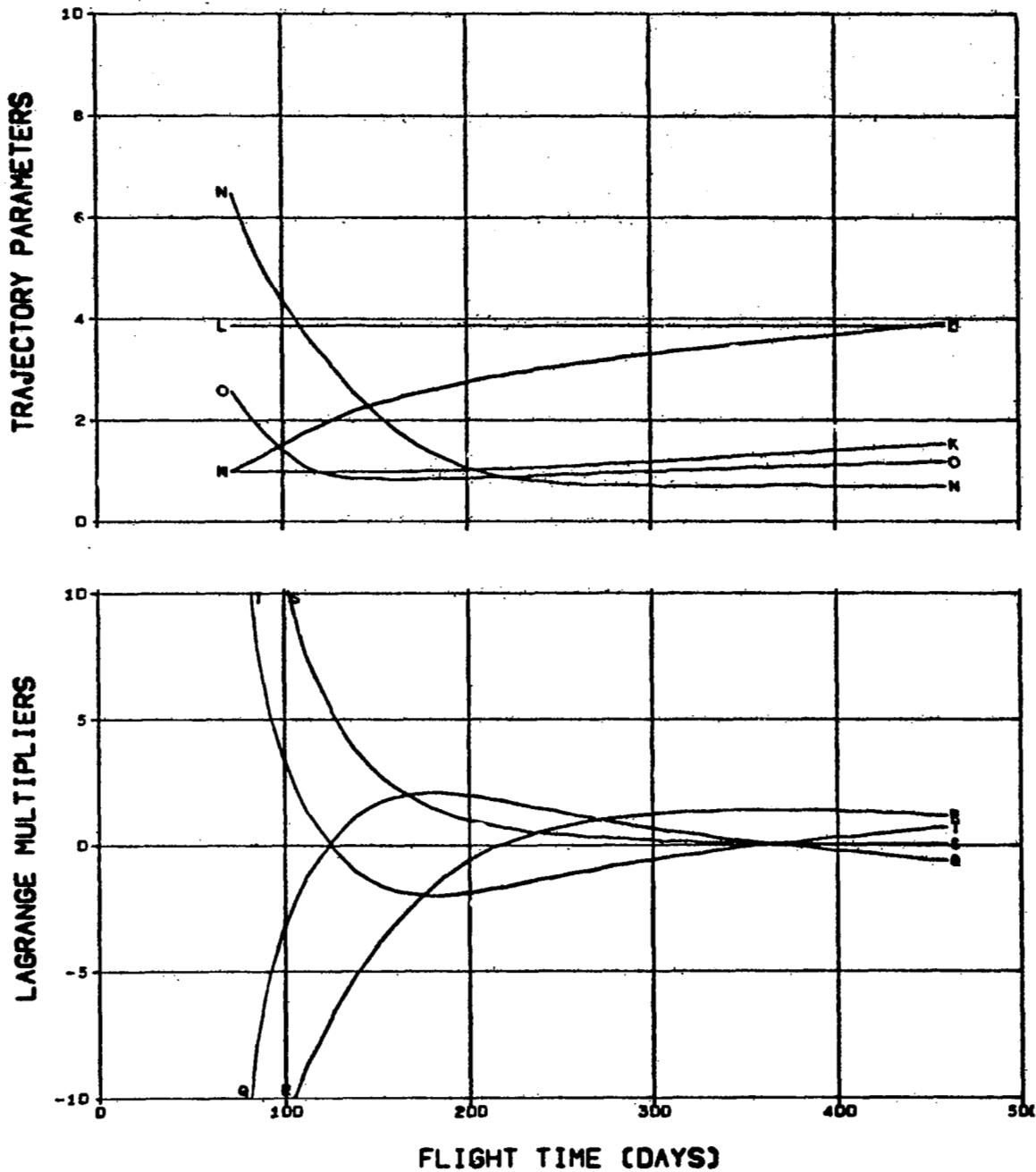


FIG. 1.1.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/100

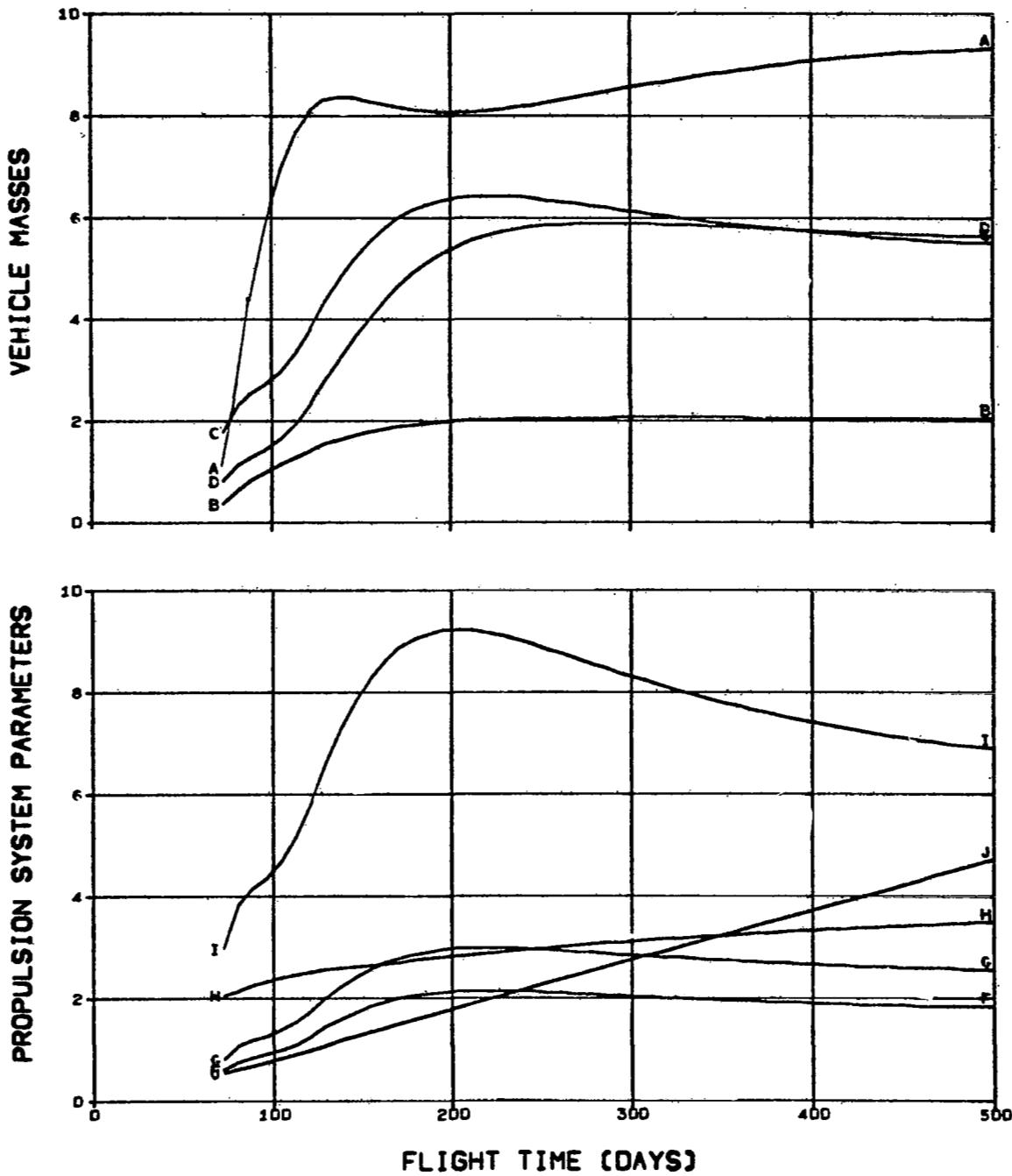


FIG. 1.1.5 MERCURY MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPERIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

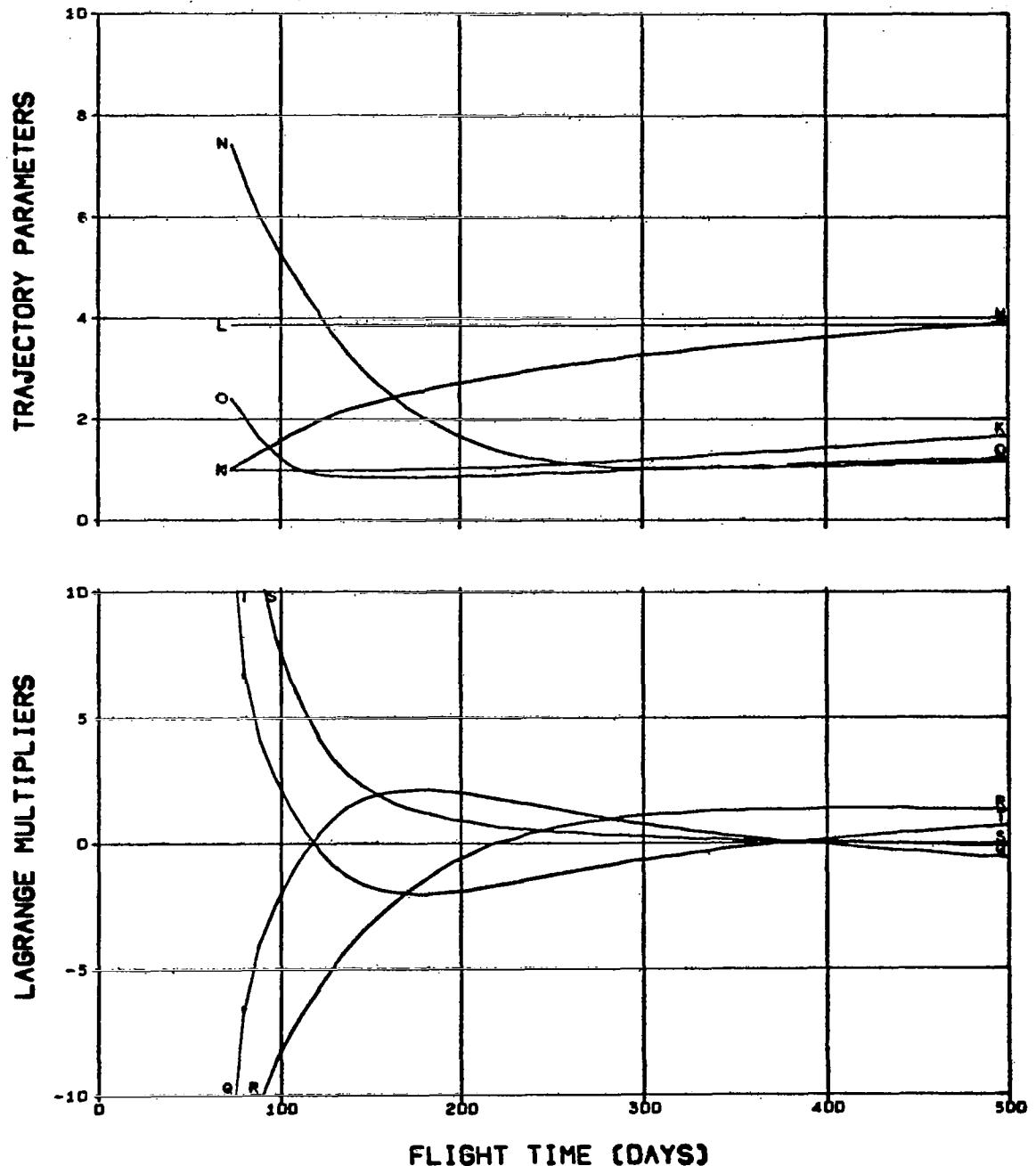


FIG. 1.1.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-2
		J	PROPULSION TIME (DAYS)/100

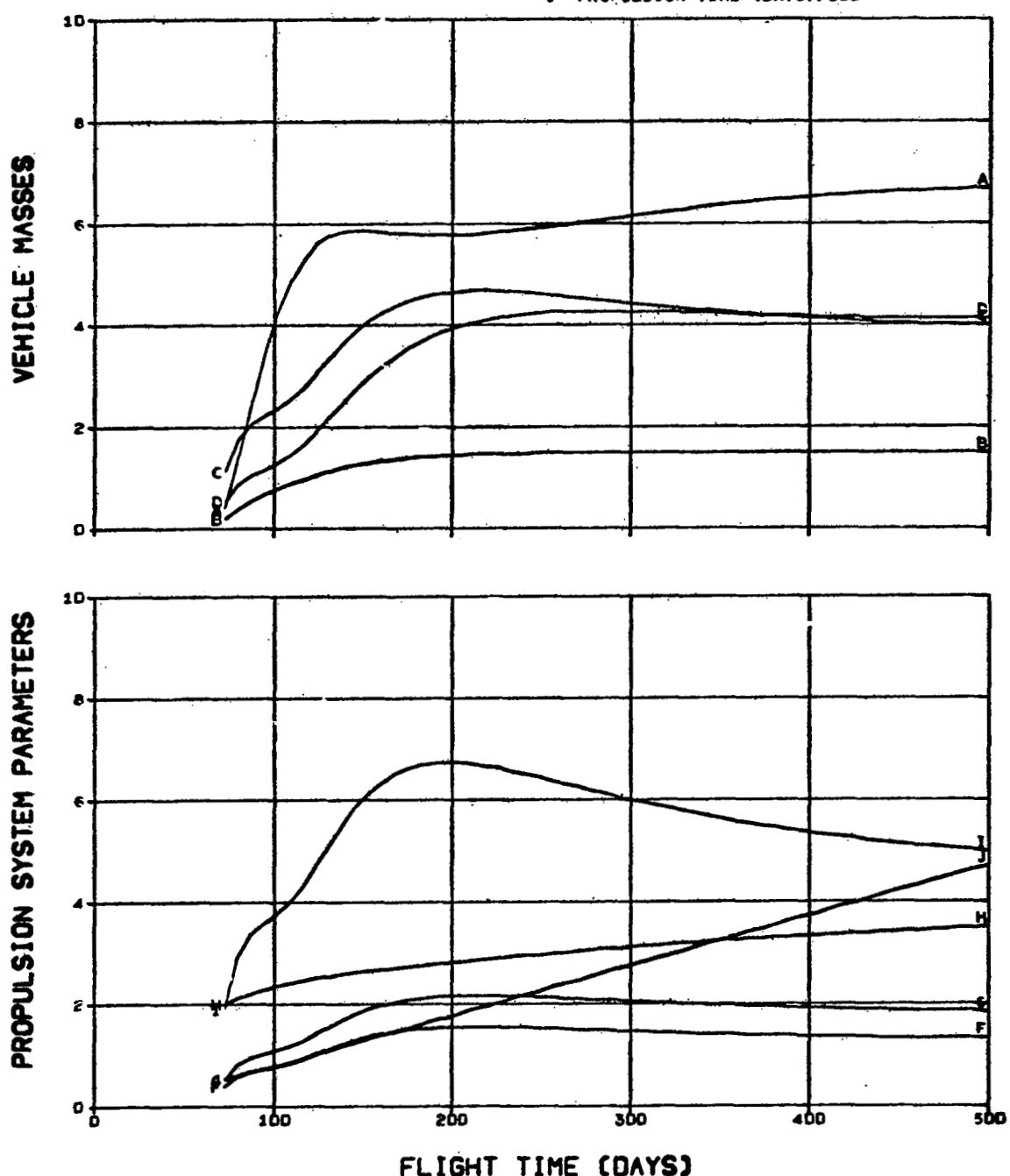


FIG. 1.1.6 MERCURY MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

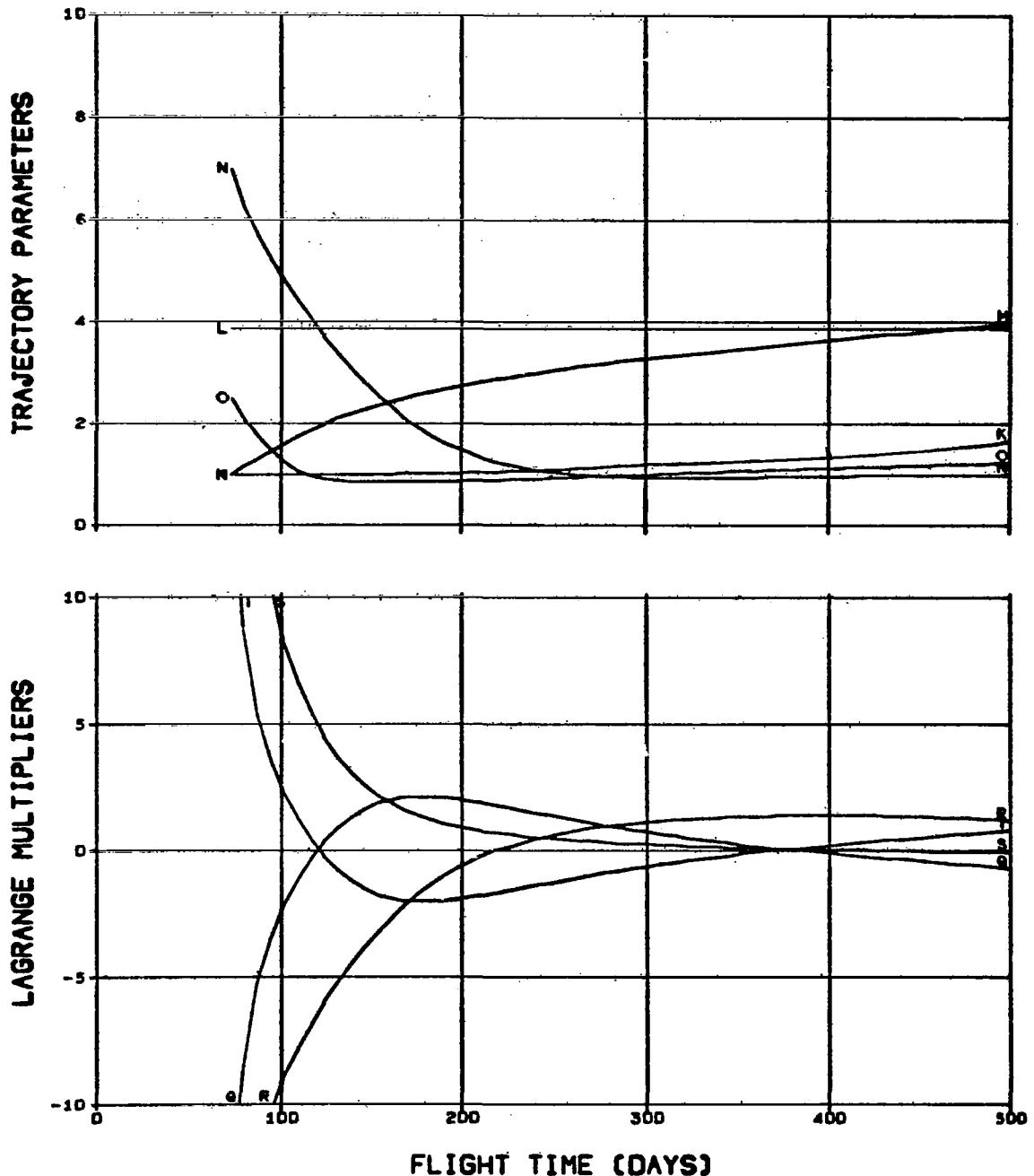


FIG. 1.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

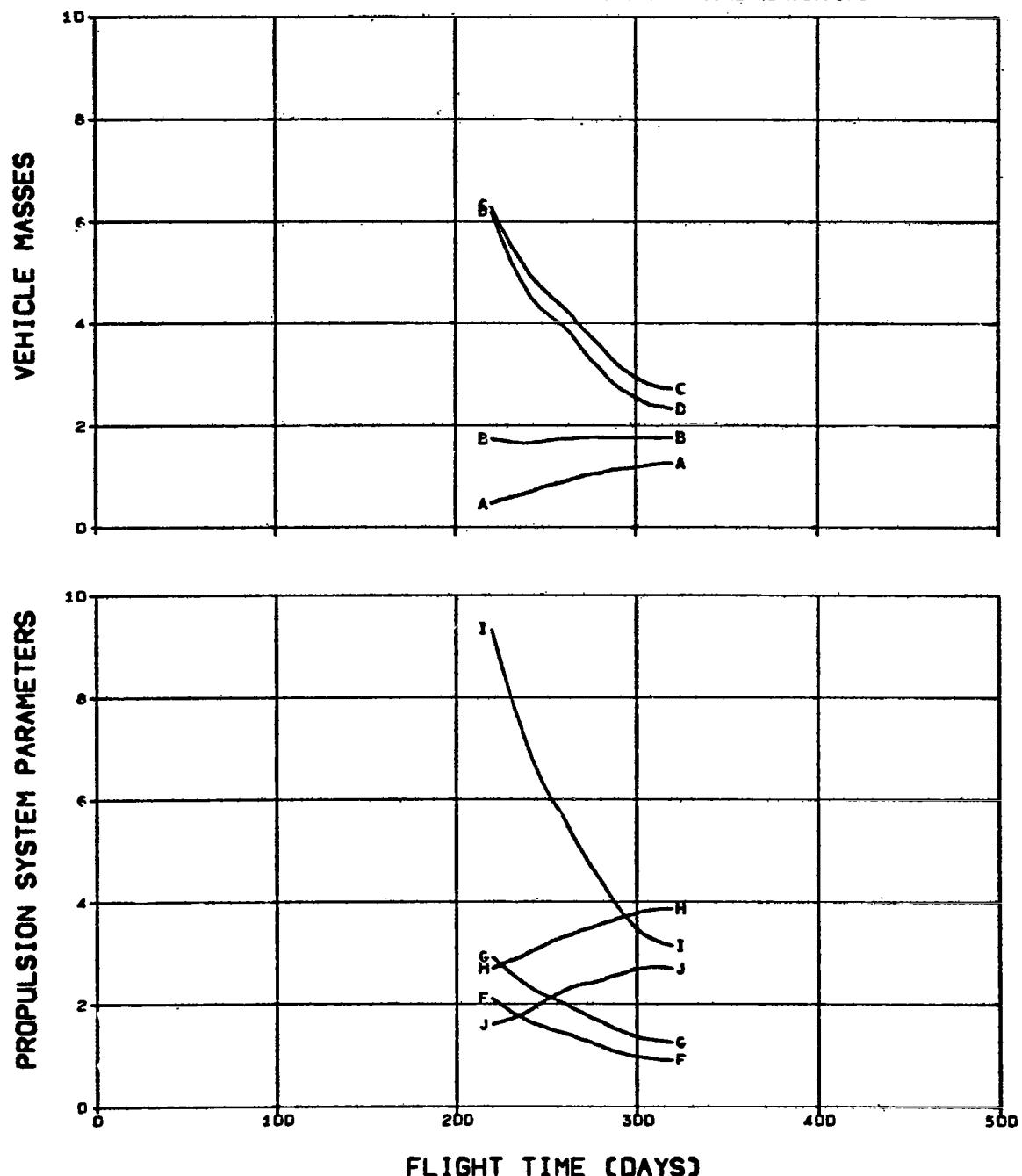


FIG. 1.2.1 MERCURY MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

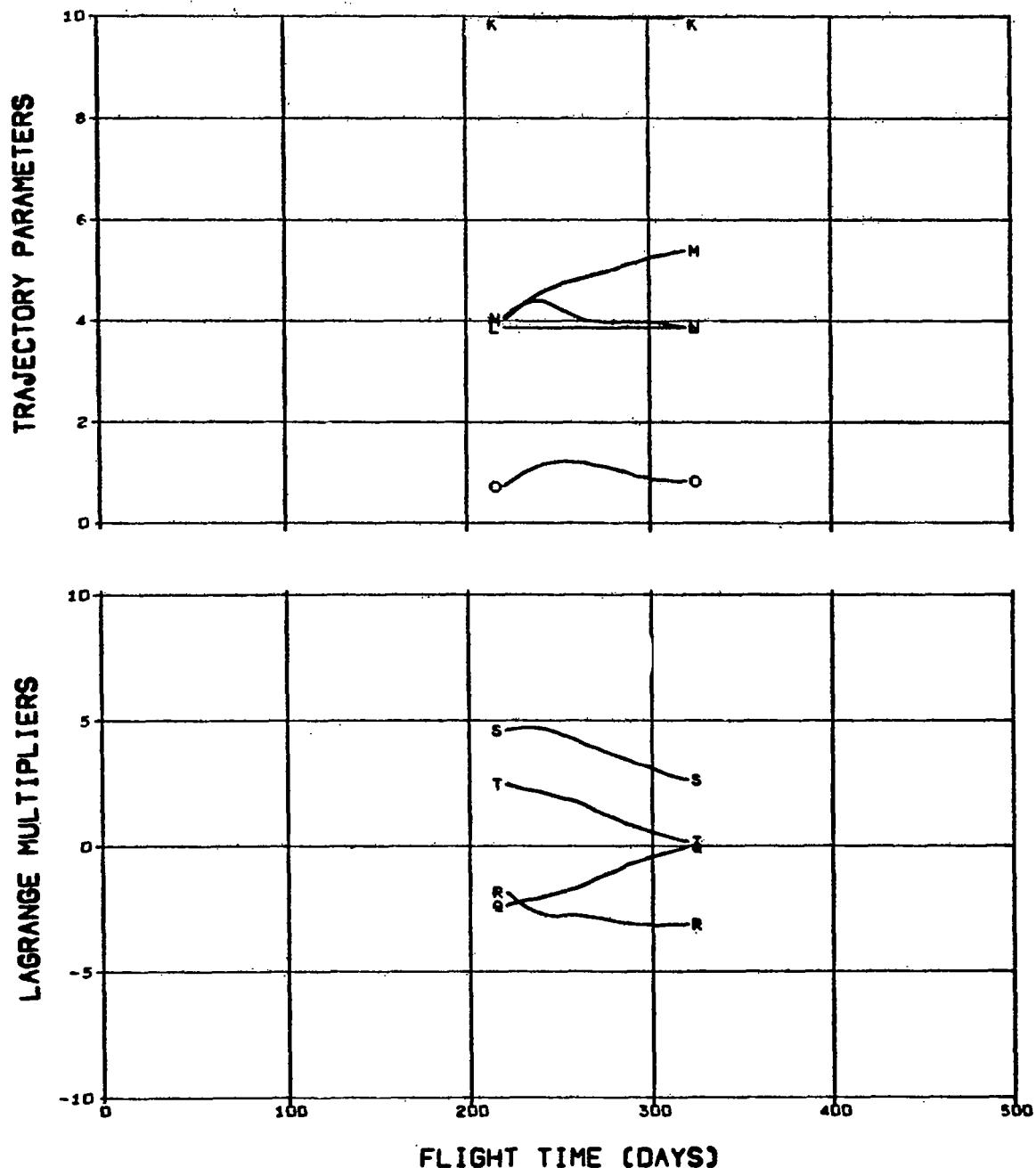


FIG. 1.2.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/10000	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/100

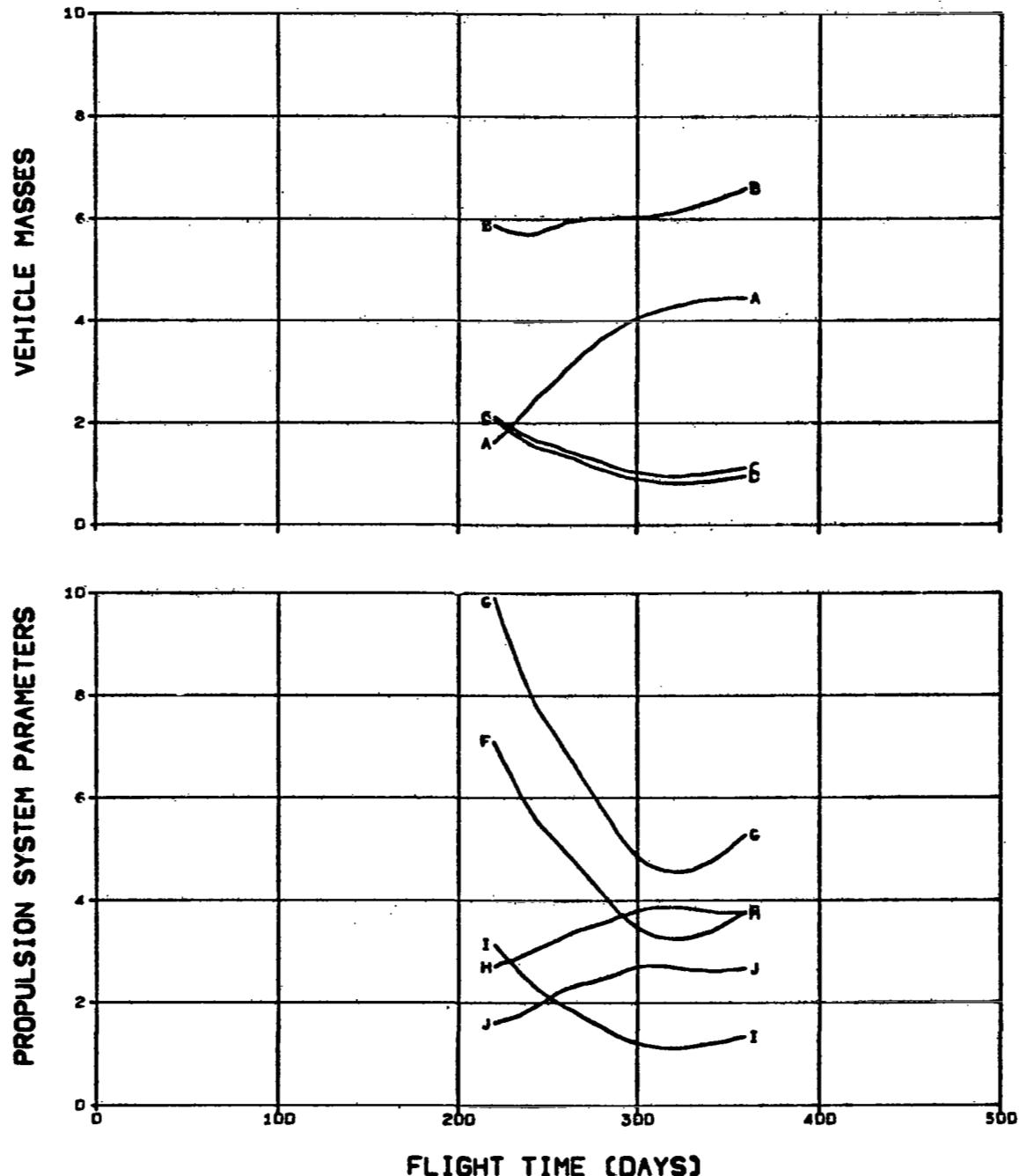


FIG. 1.2.2 MERCURY MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

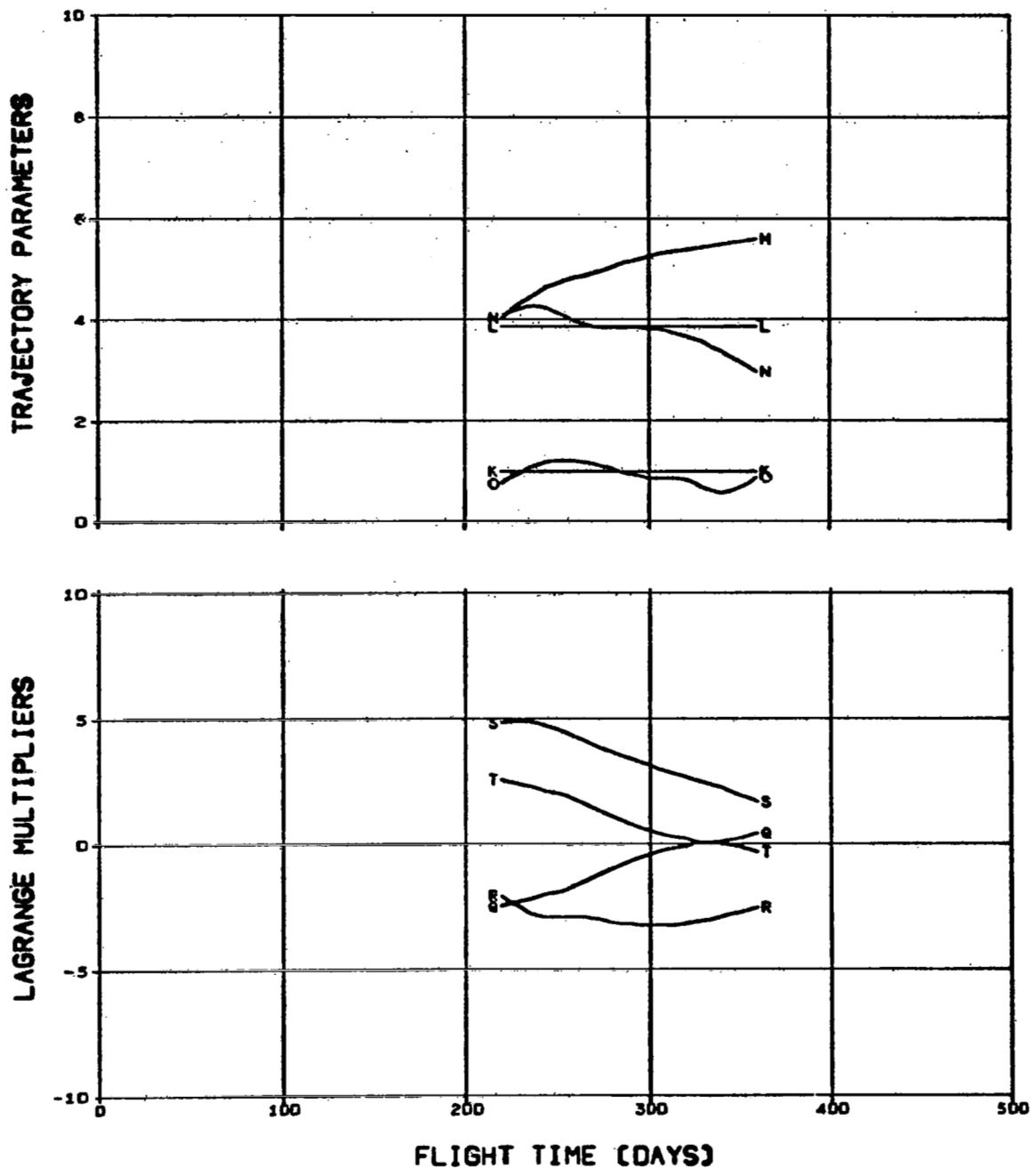


FIG. 1.2.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

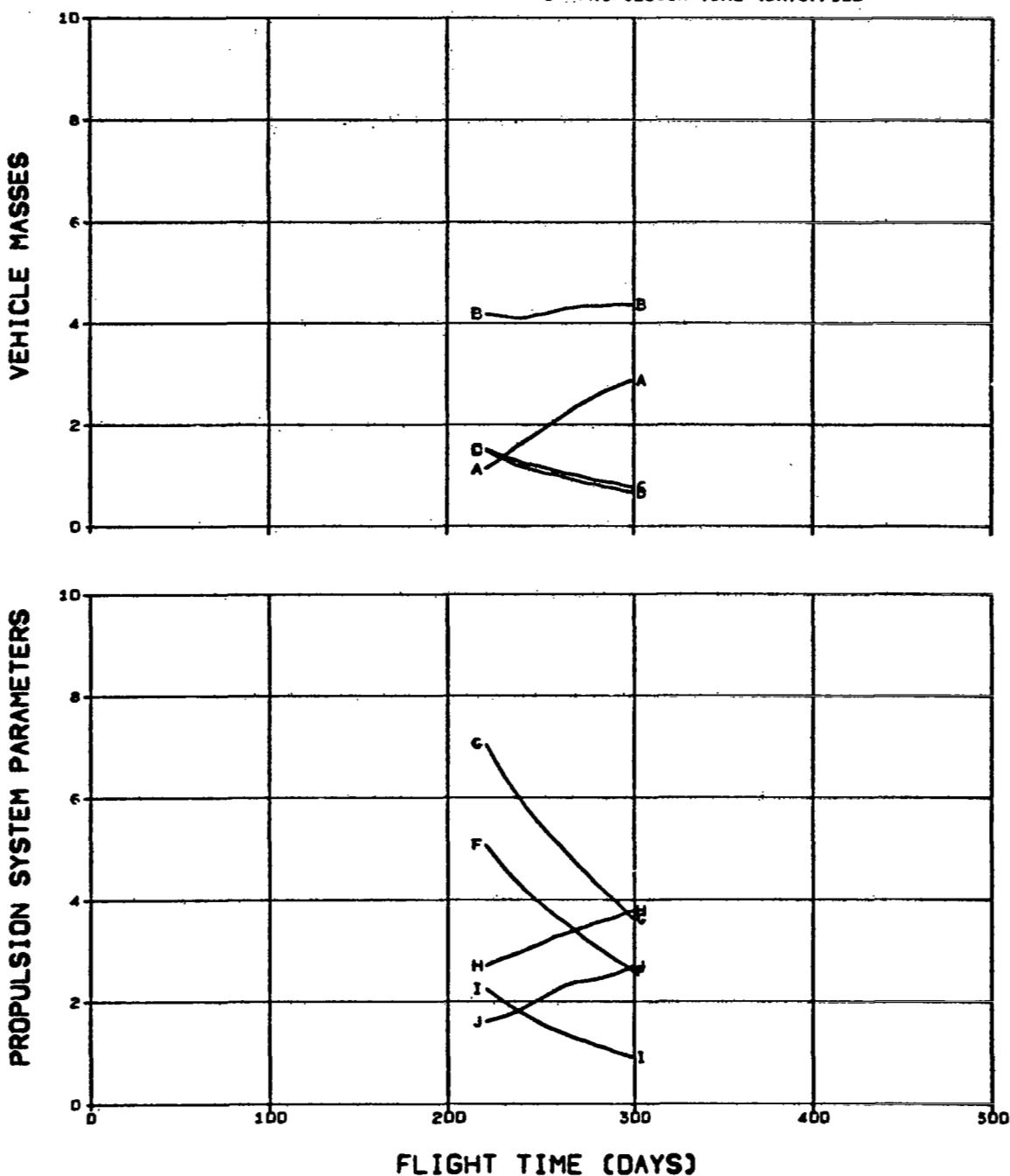


FIG. 1.2.3 MERCURY MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	S	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	T	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000		Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

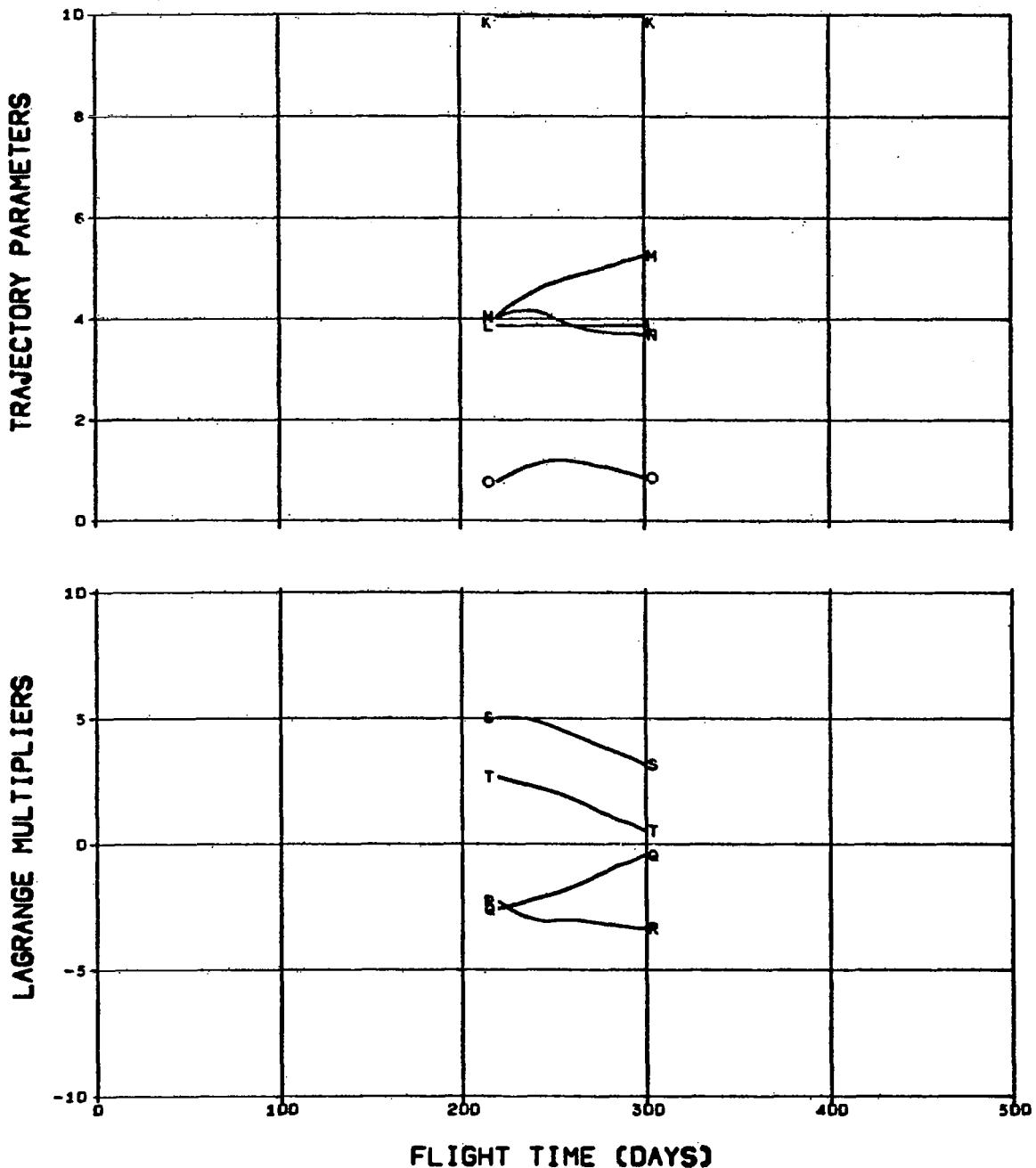


FIG. 1.2.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/100

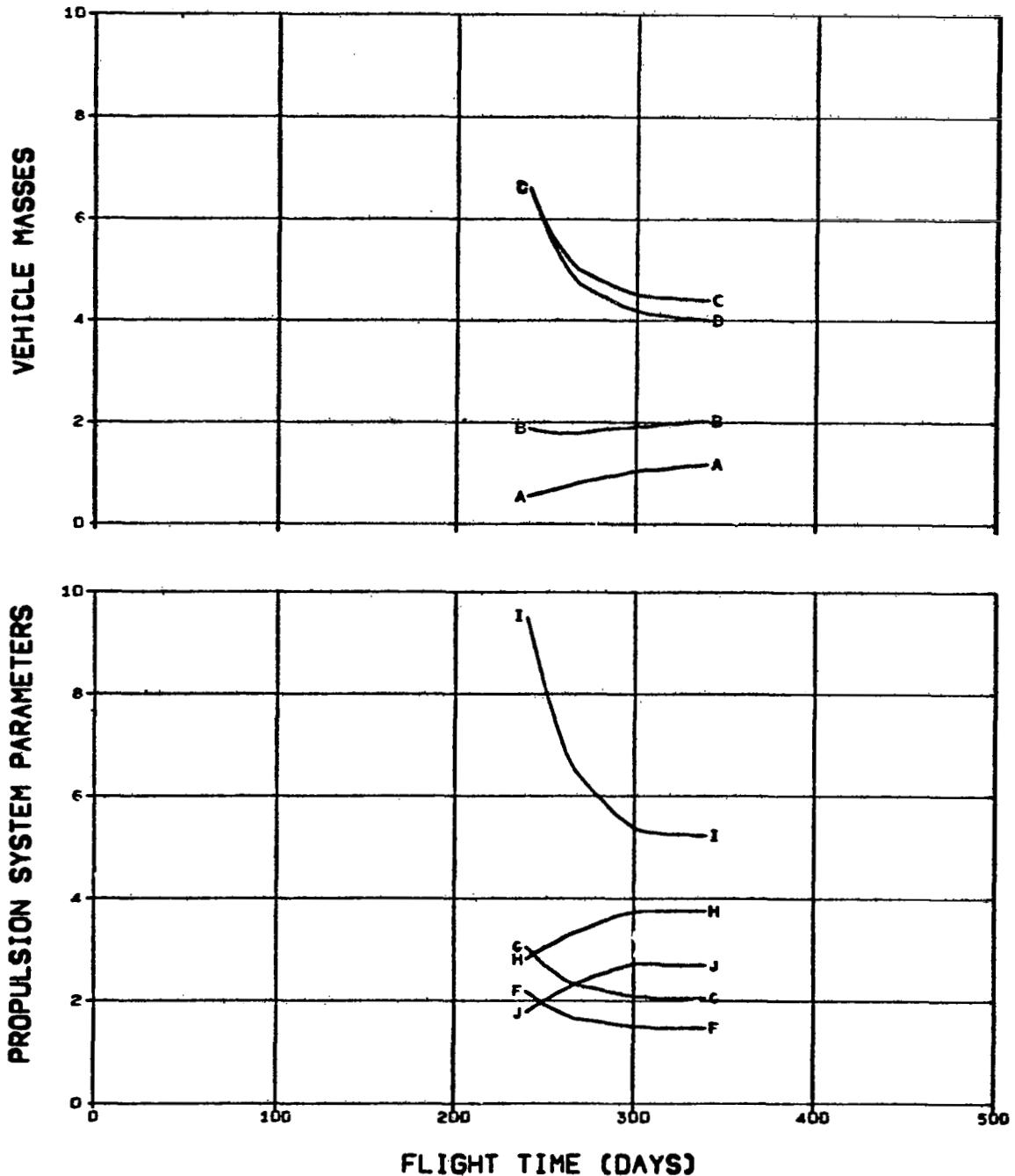


FIG. 1.2.4 MERCURY MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

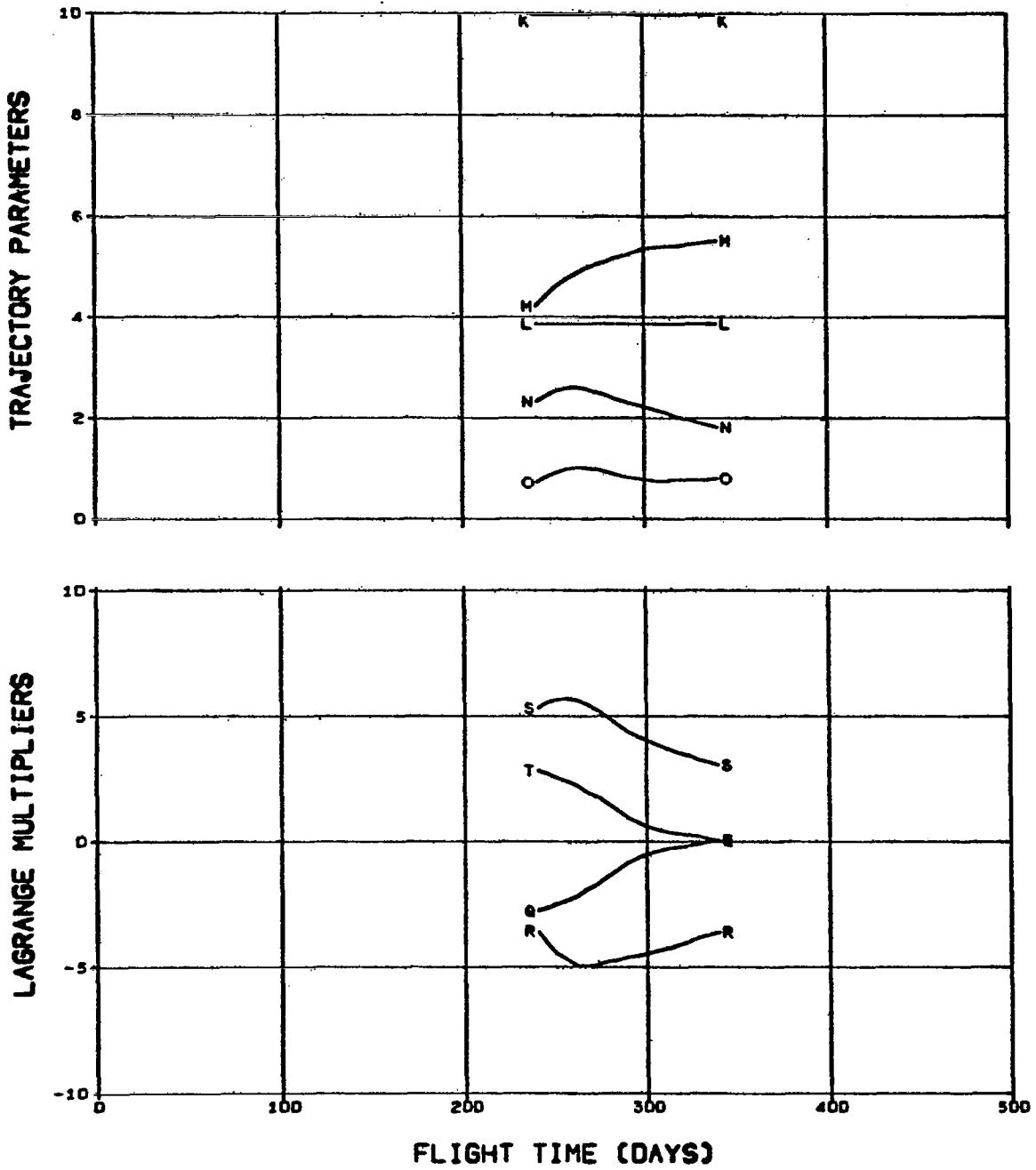


FIG. 1.2.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/100

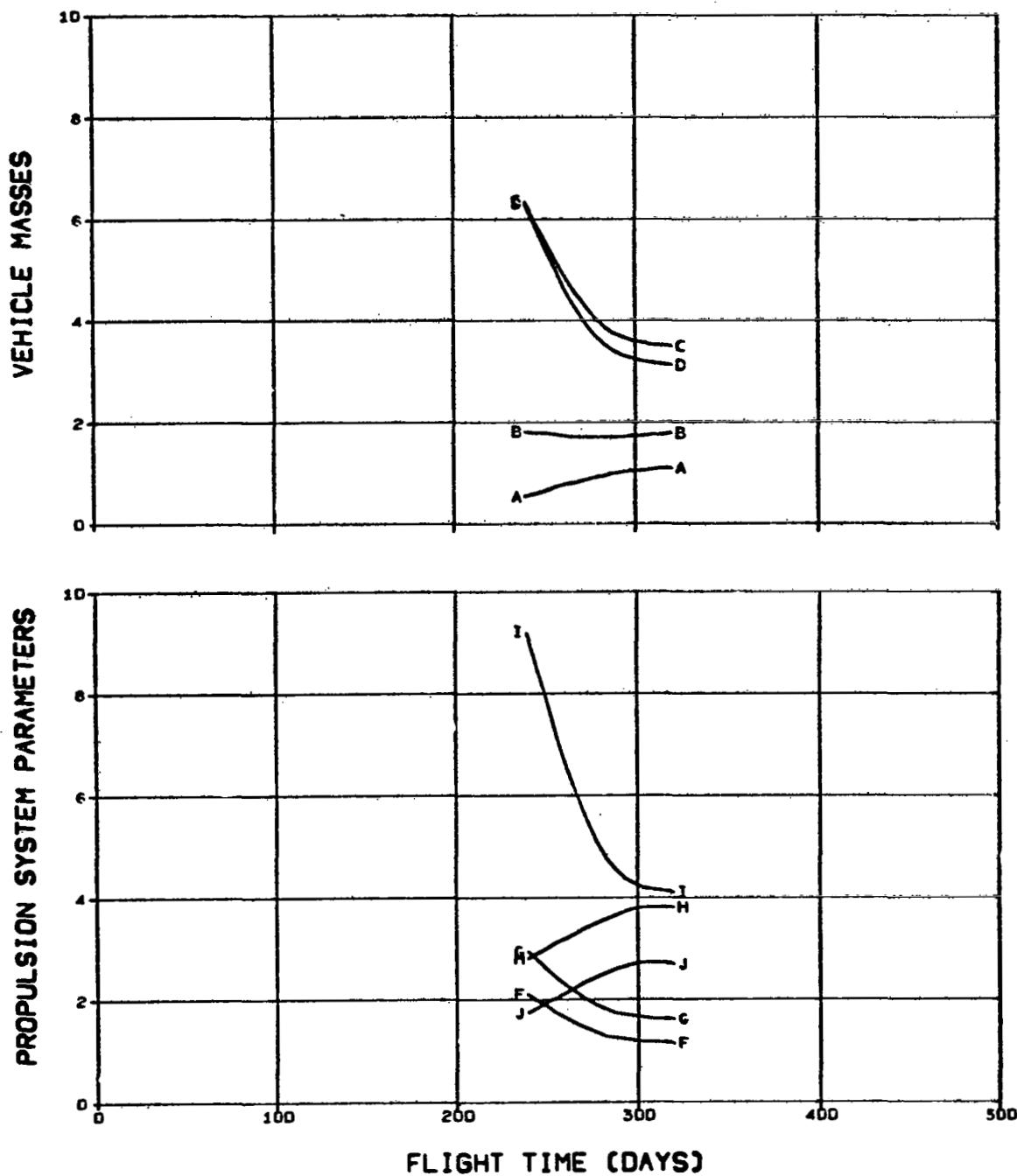


FIG. 1.2.5 MERCURY MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/1.GOE-1 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.GOE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

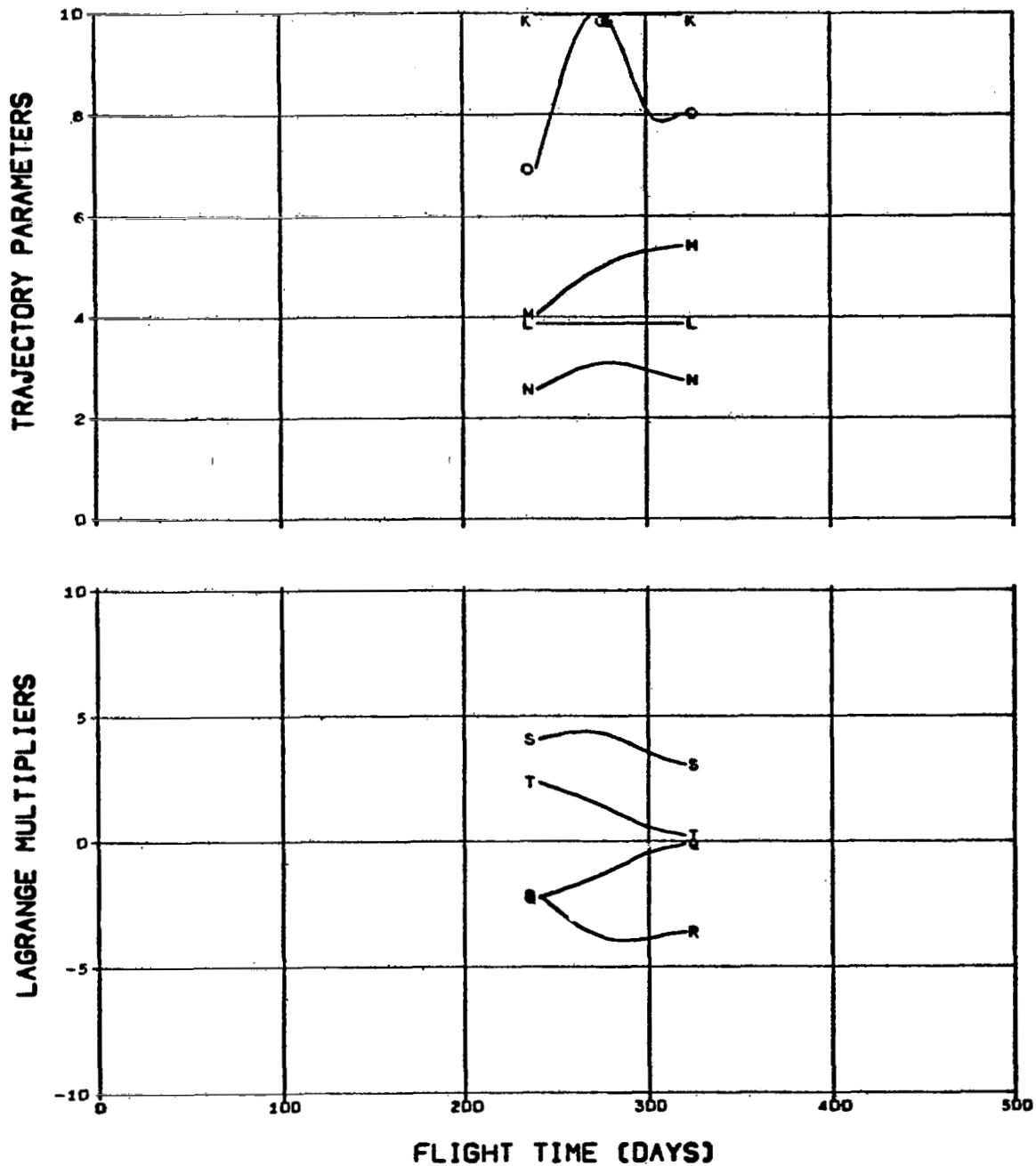


FIG. 1.2.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLUTION TIME (DAYS)/100

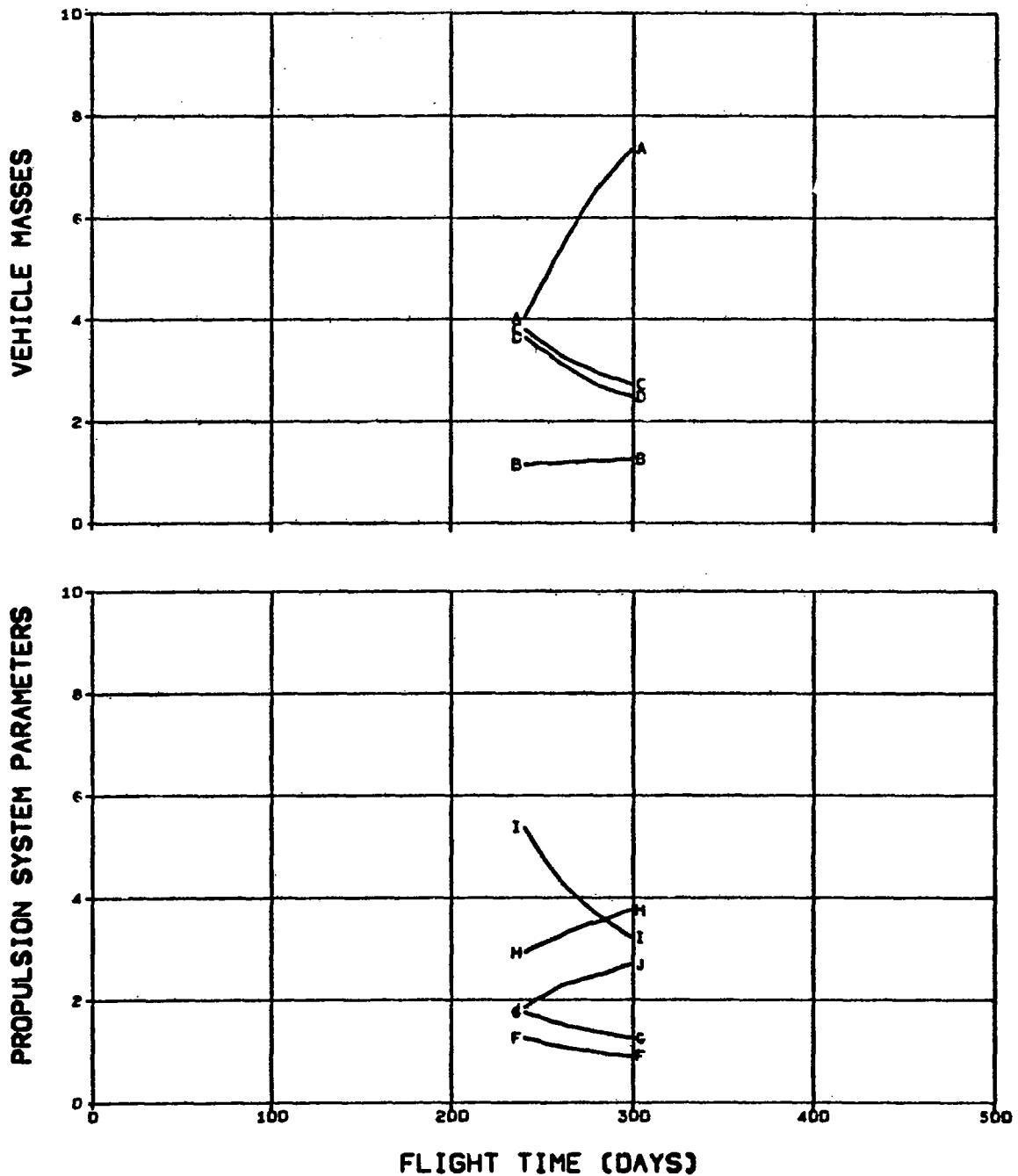


FIG. 1.2.6 MERCURY MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K. MAXIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER
 L. MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M. HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N. LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O. ARRIVAL EXCESS SPEED (M/SEC)/10000

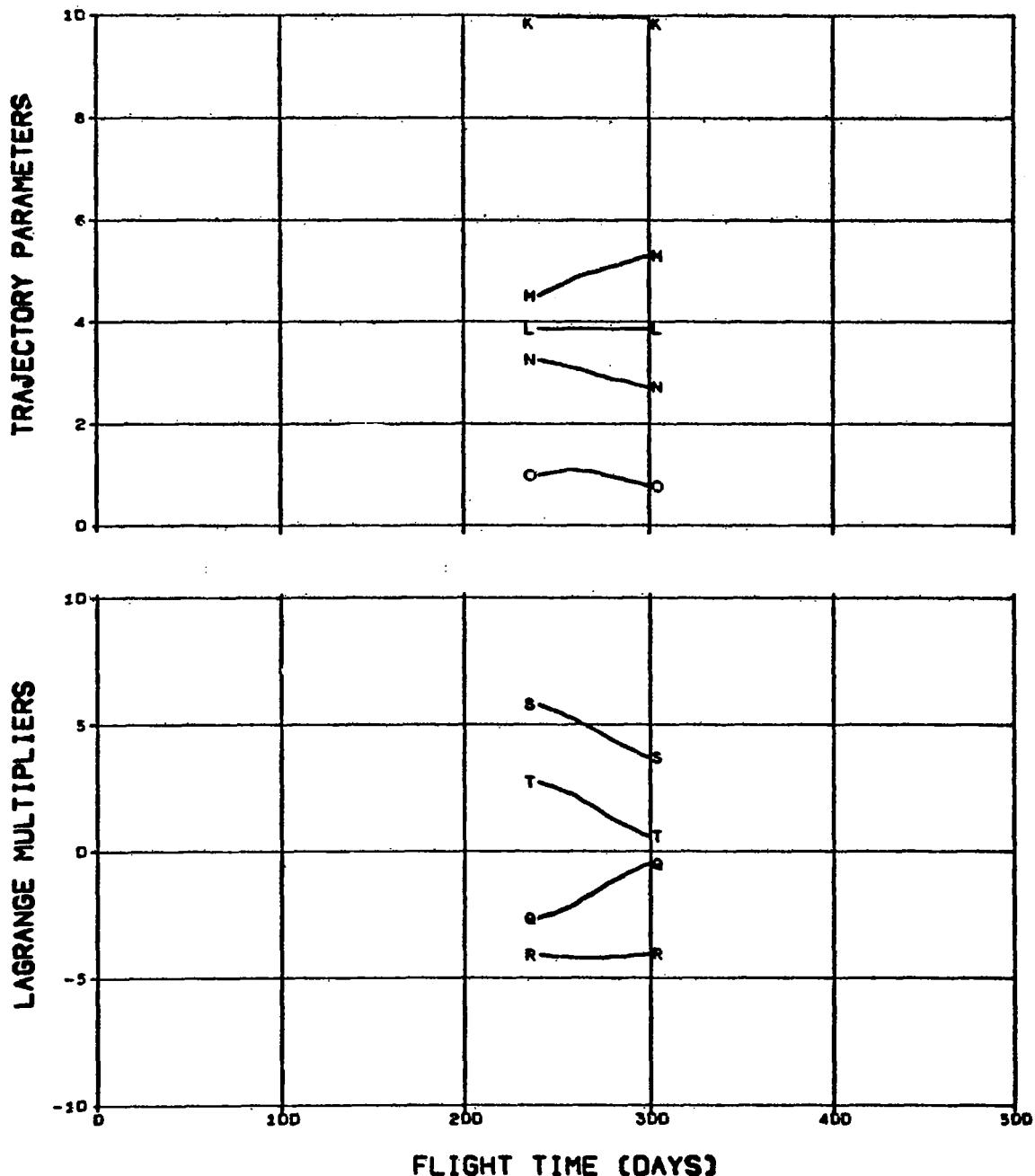


FIG. 1.2.6 (CONCLUDED)

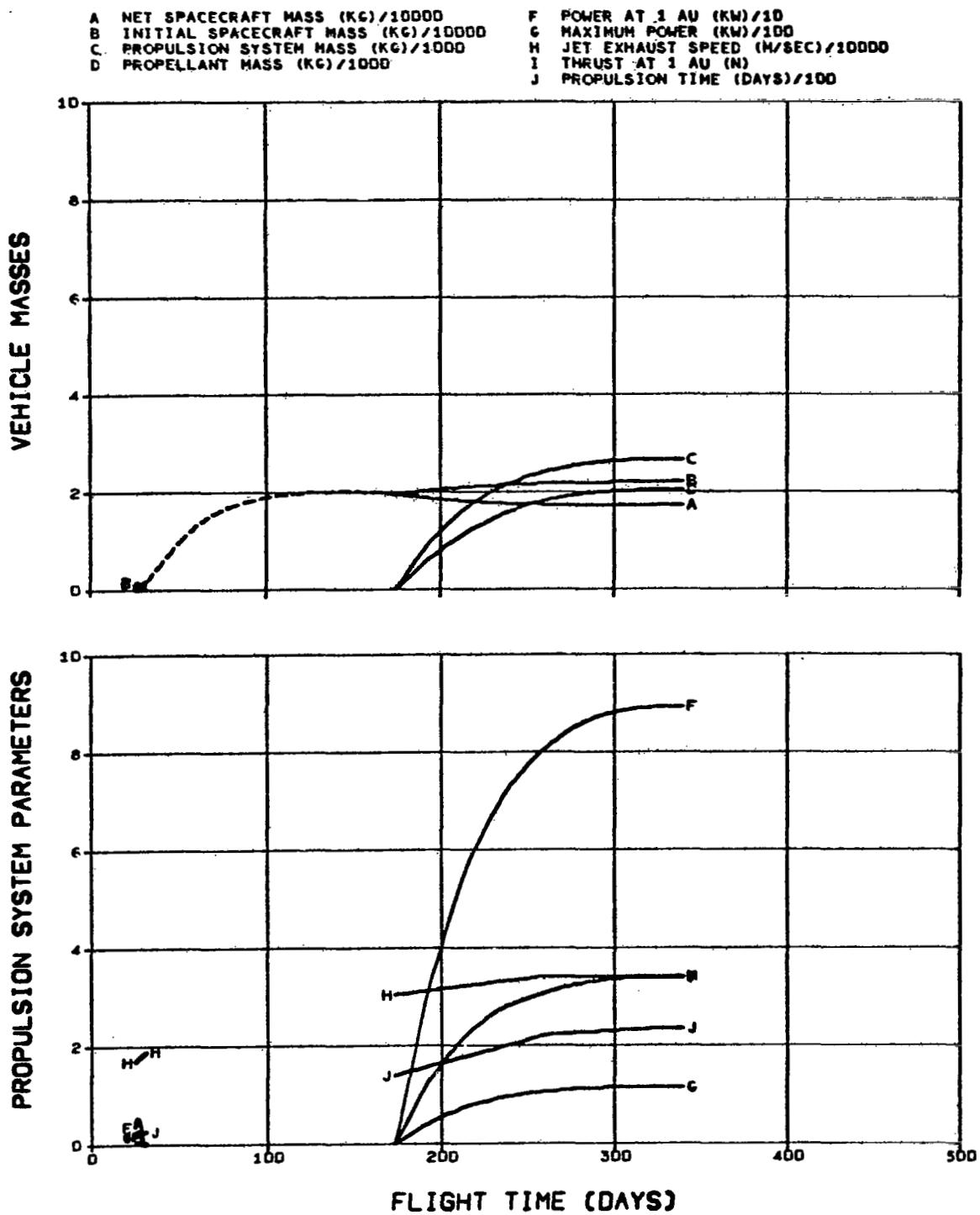


FIG. 2.1.1 VENUS MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

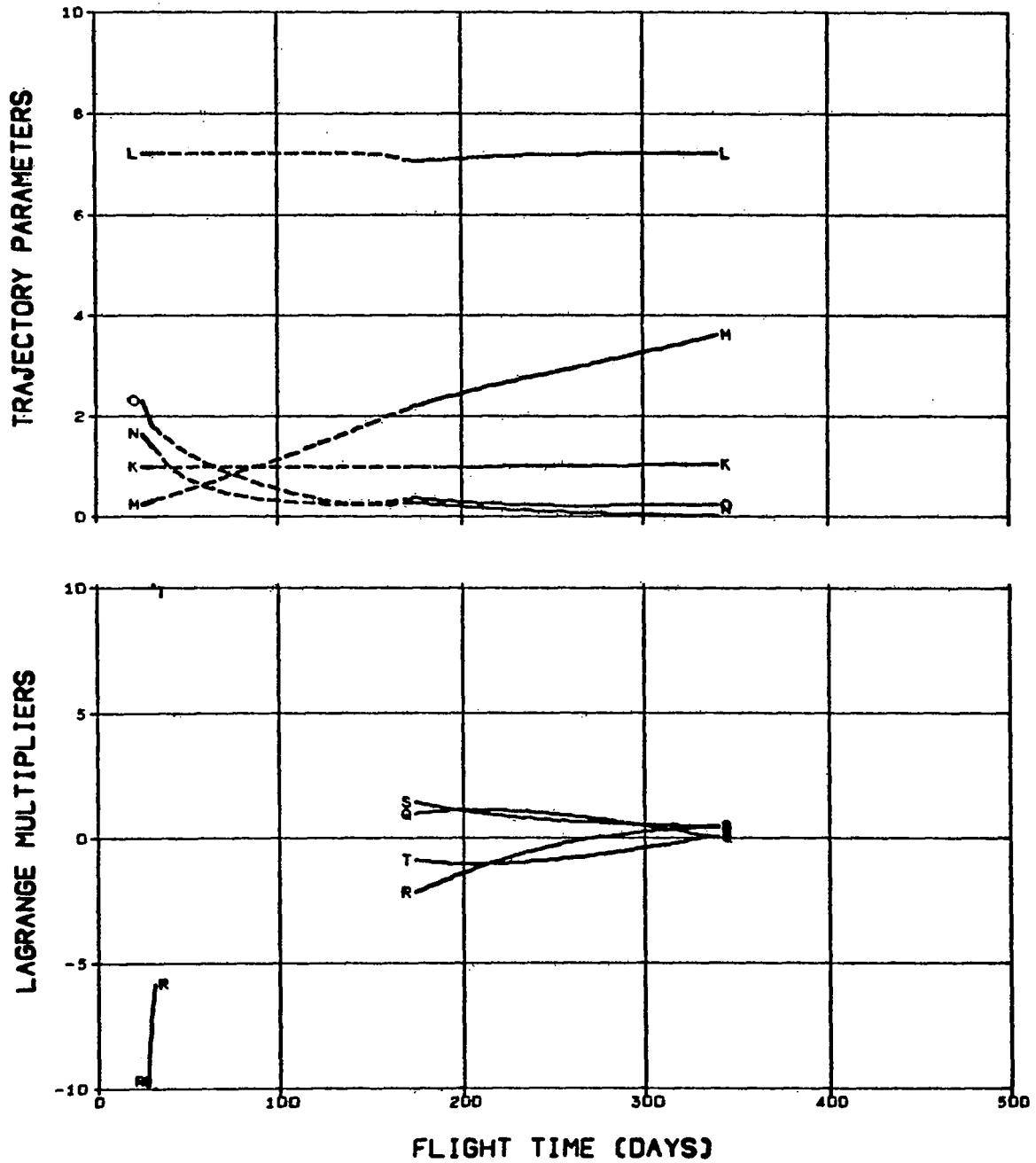


FIG. 2.1.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/100

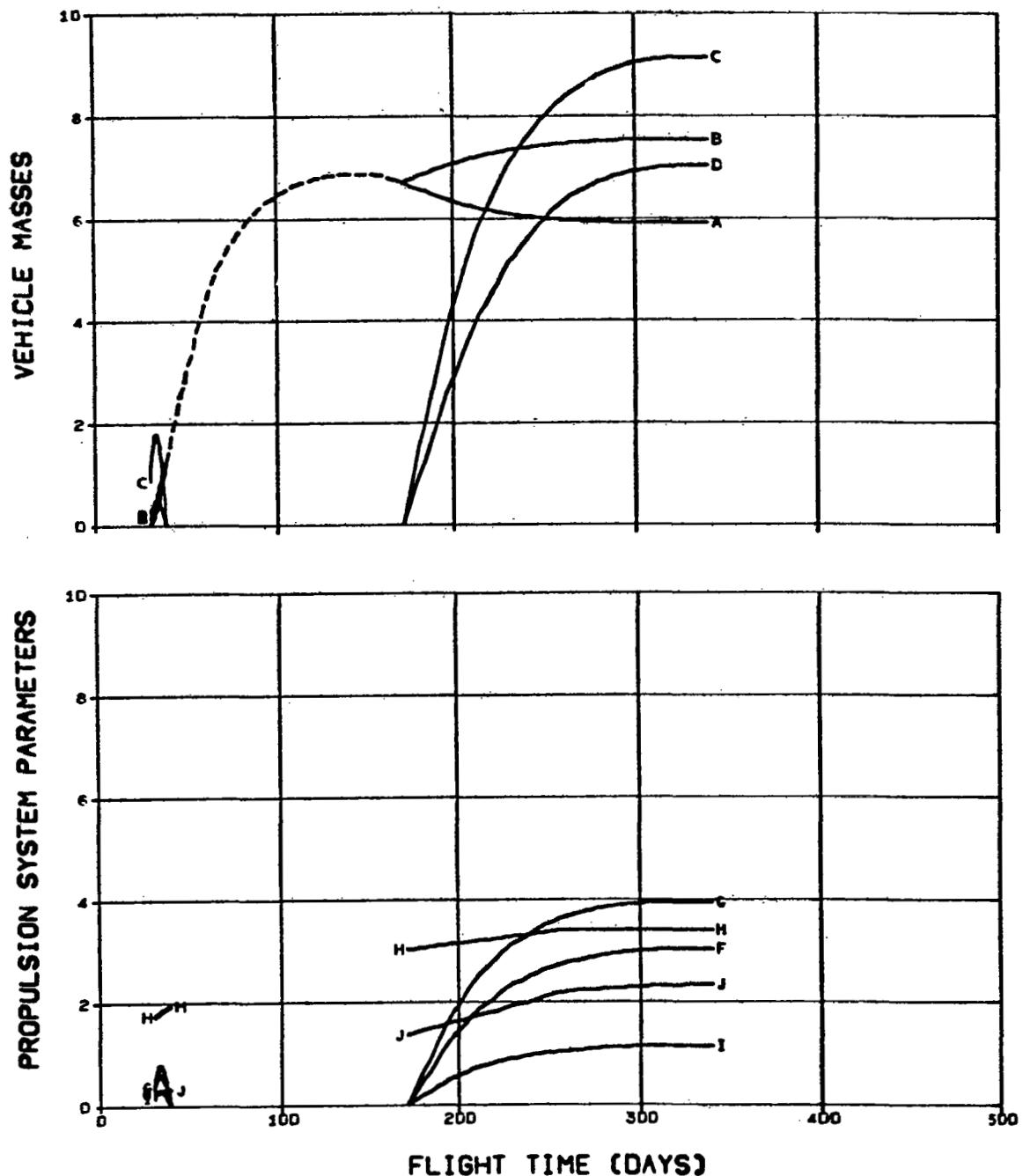


FIG. 2.1.2 VENUS MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

R	MAXIMUM SOLAR DISTANCE (AU)	S	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-2	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

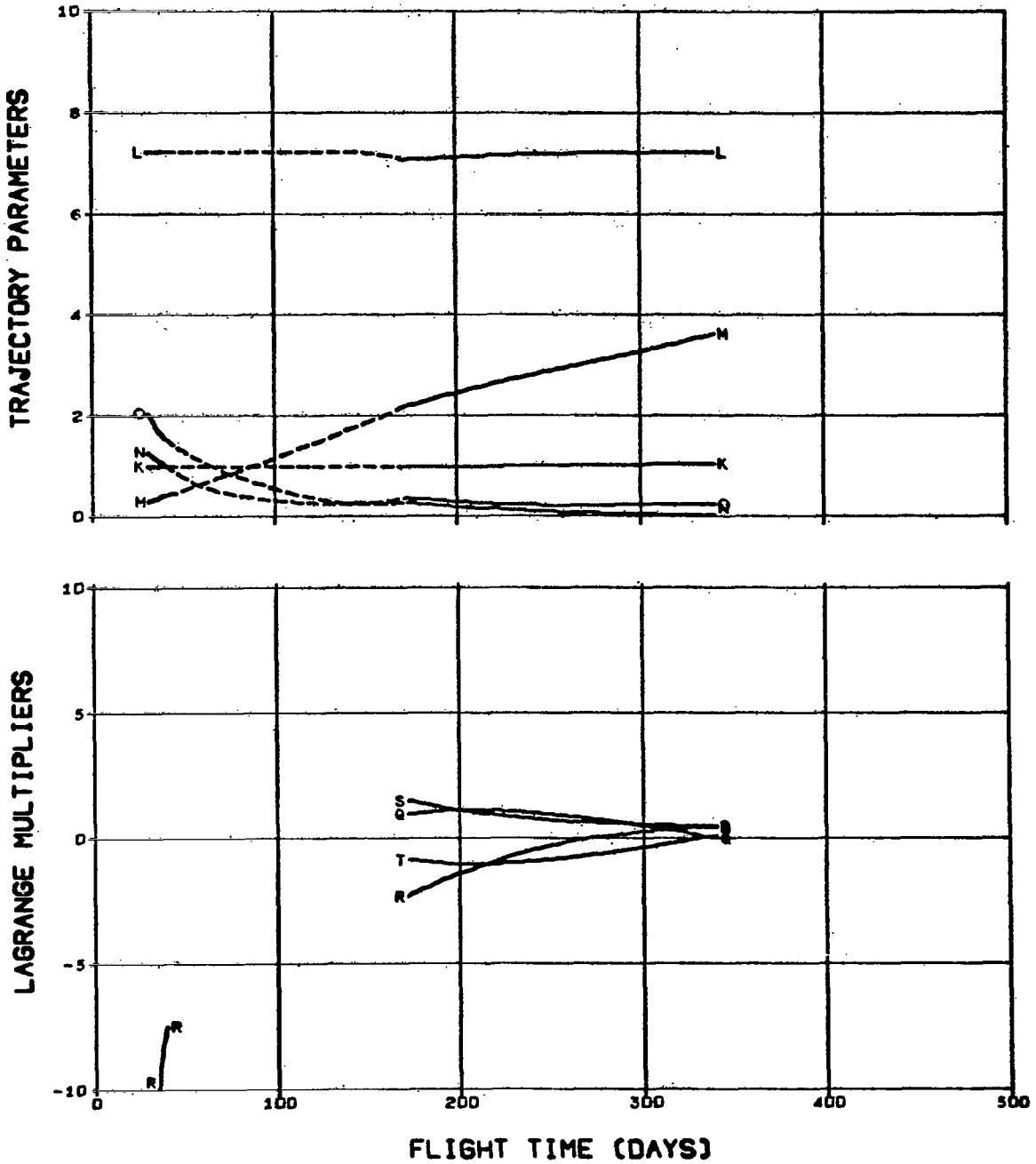


FIG. 2.1.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/100

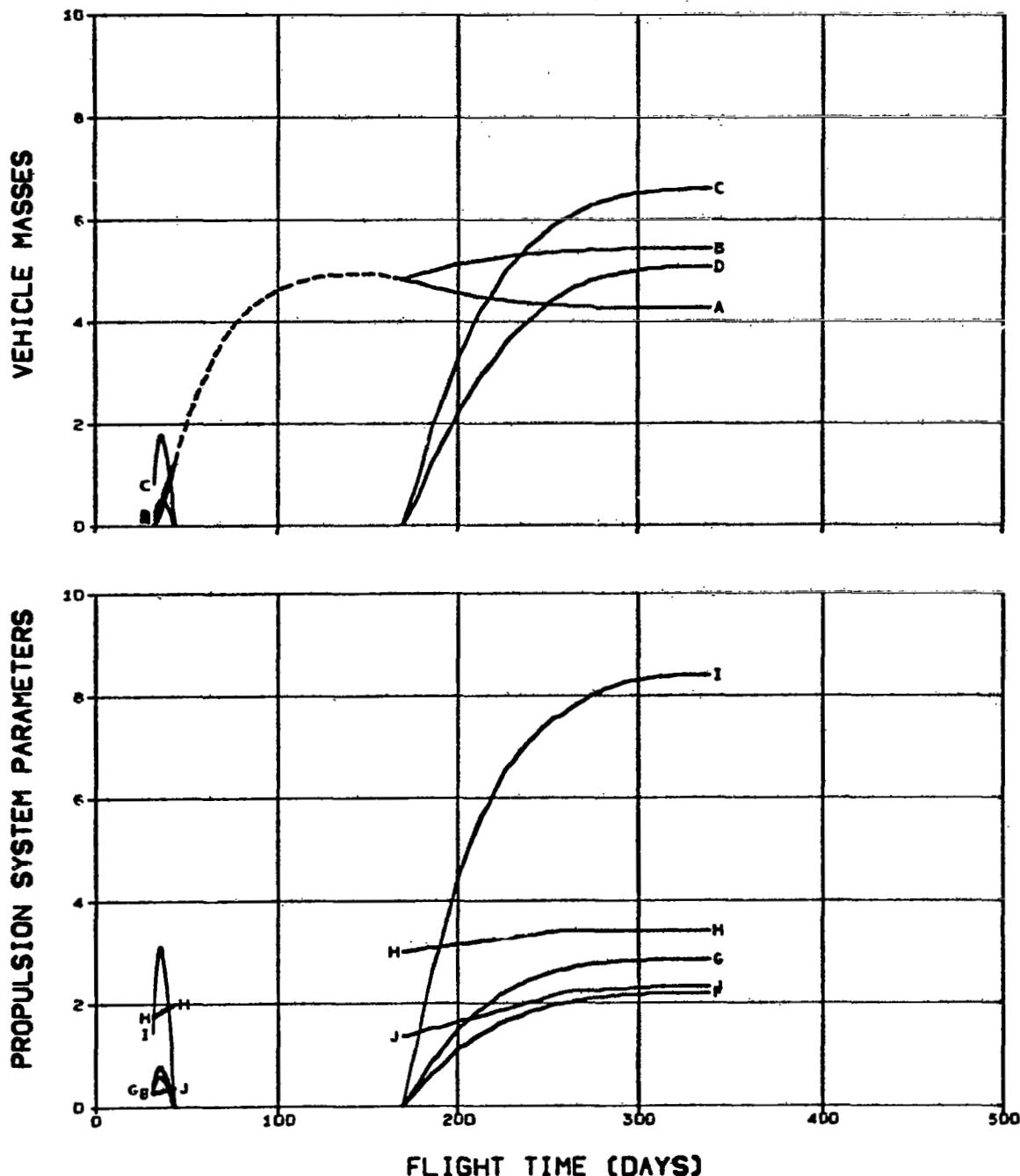


FIG. 2.1.3 VENUS MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) R X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 S Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 T X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/10000 U Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

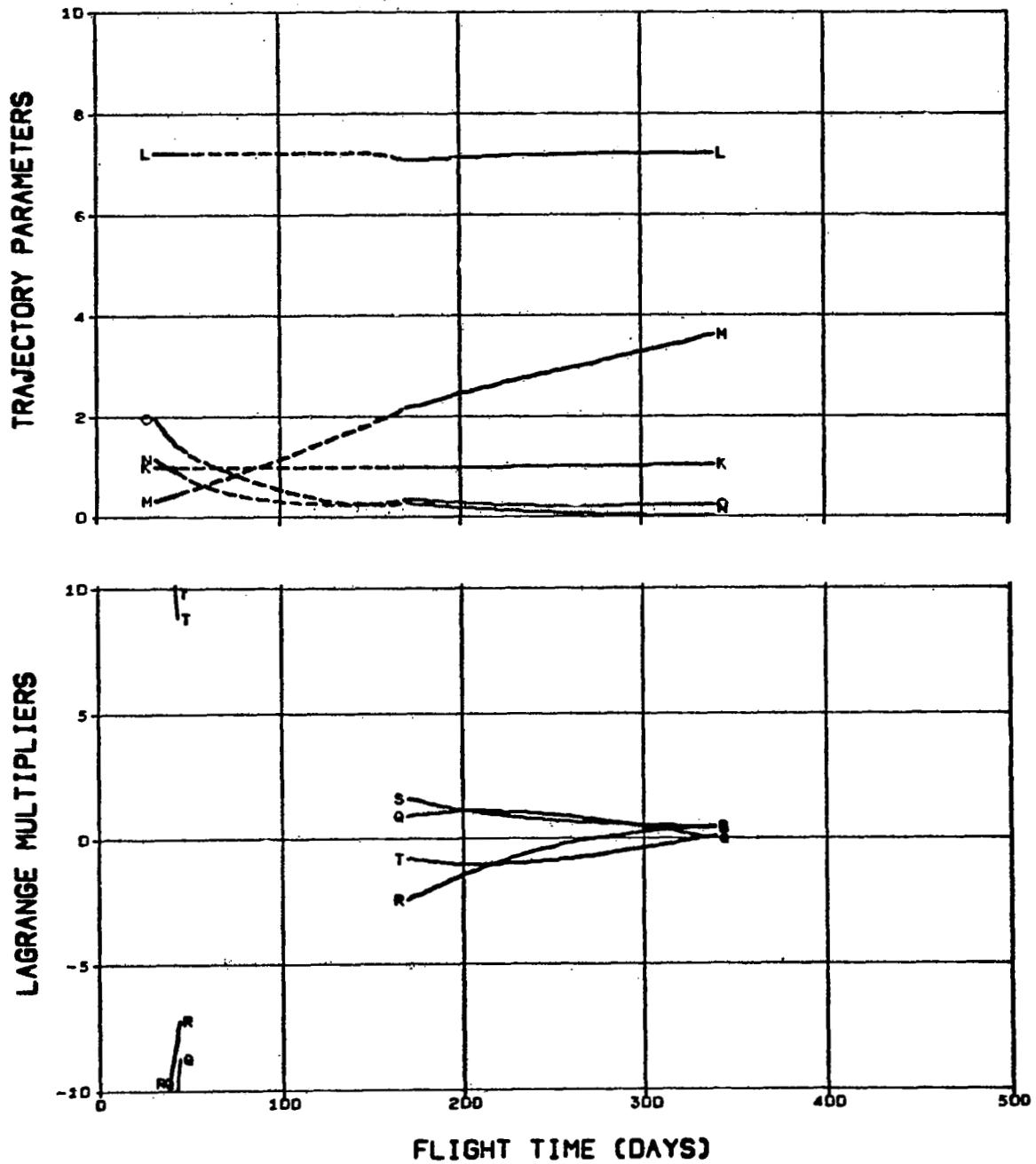


FIG. 2.1.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/100

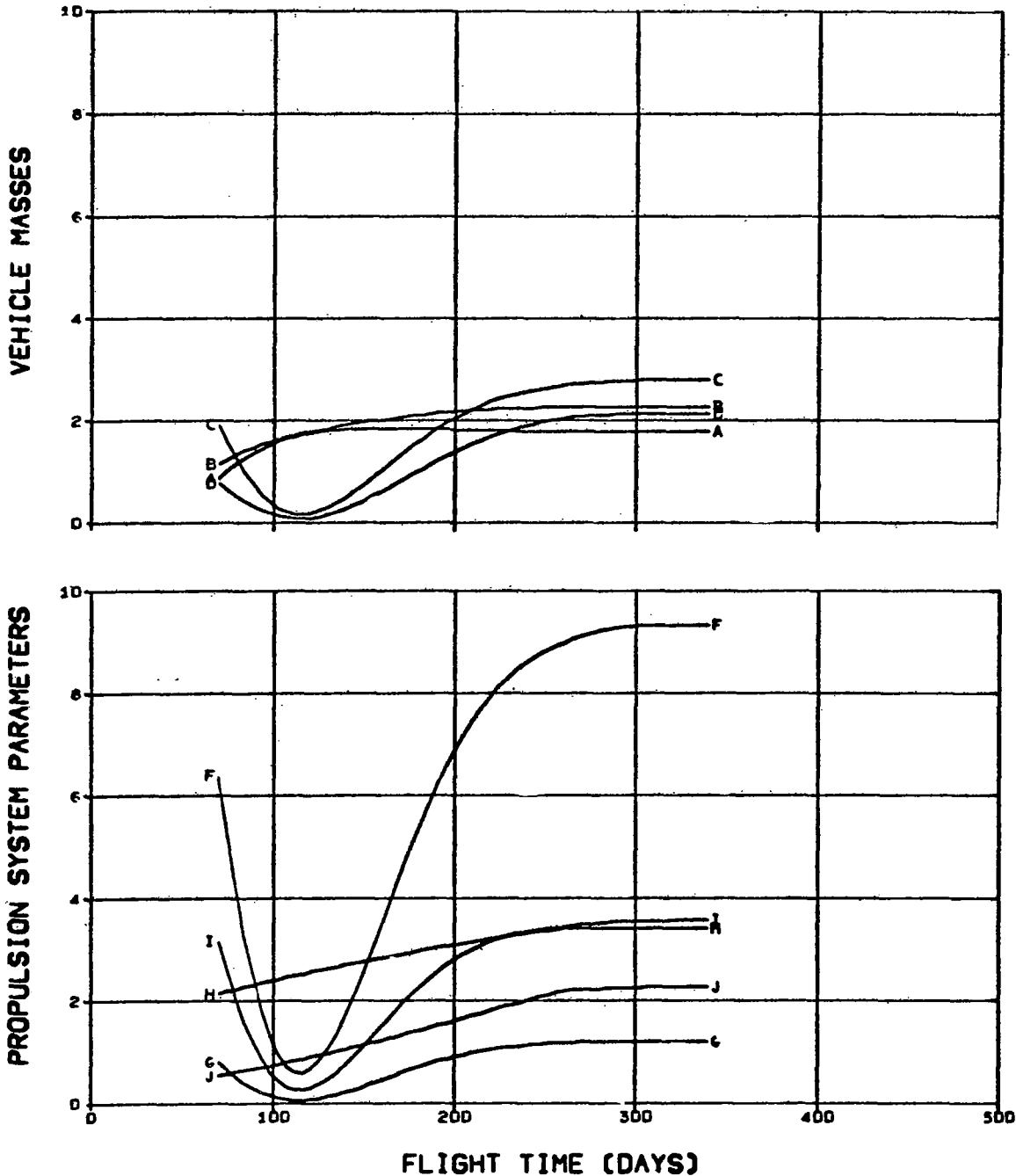


FIG. 2.1.4 VENUS MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

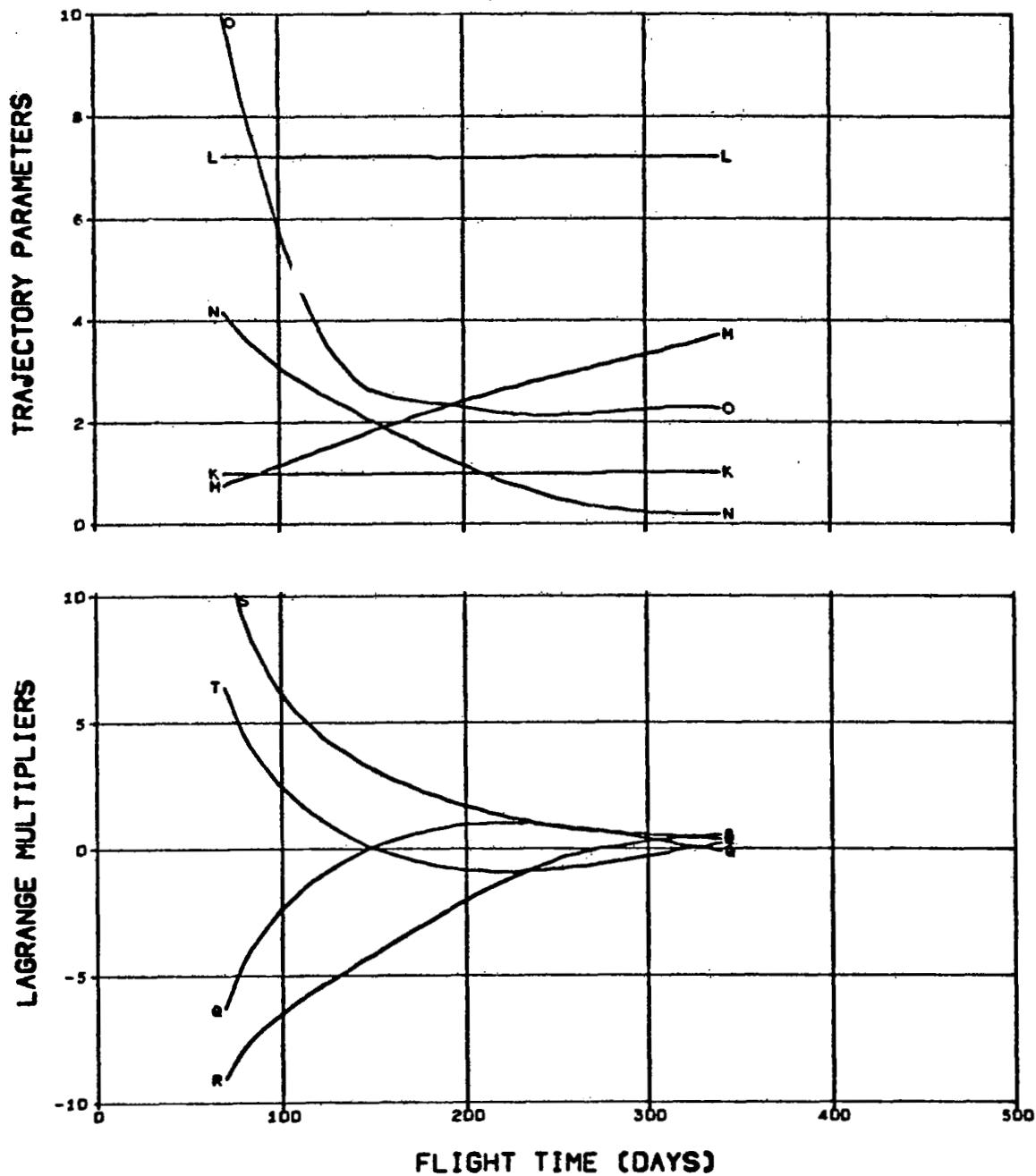


FIG. 2.1.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/100

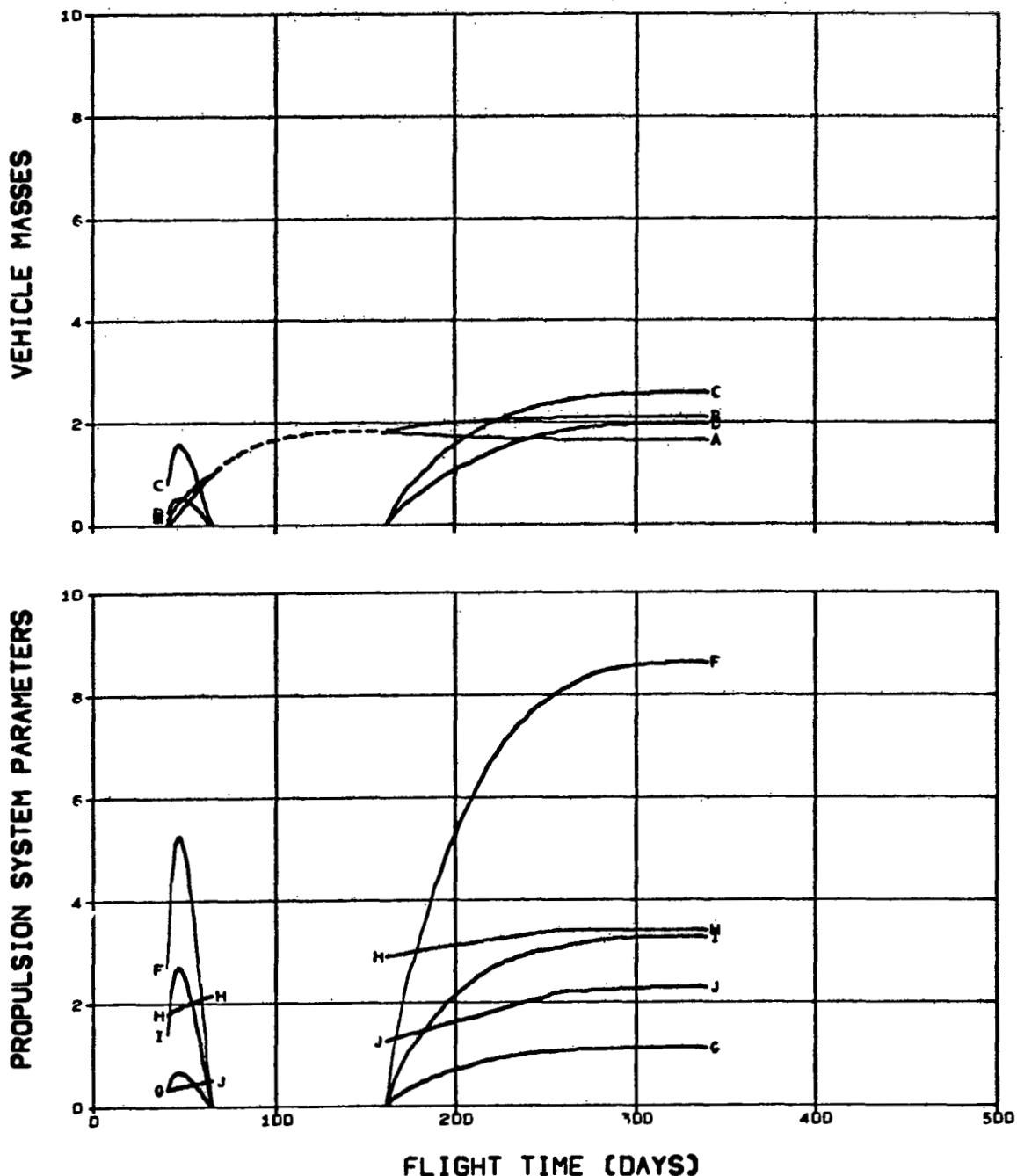


FIG. 2.1.5 VENUS MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

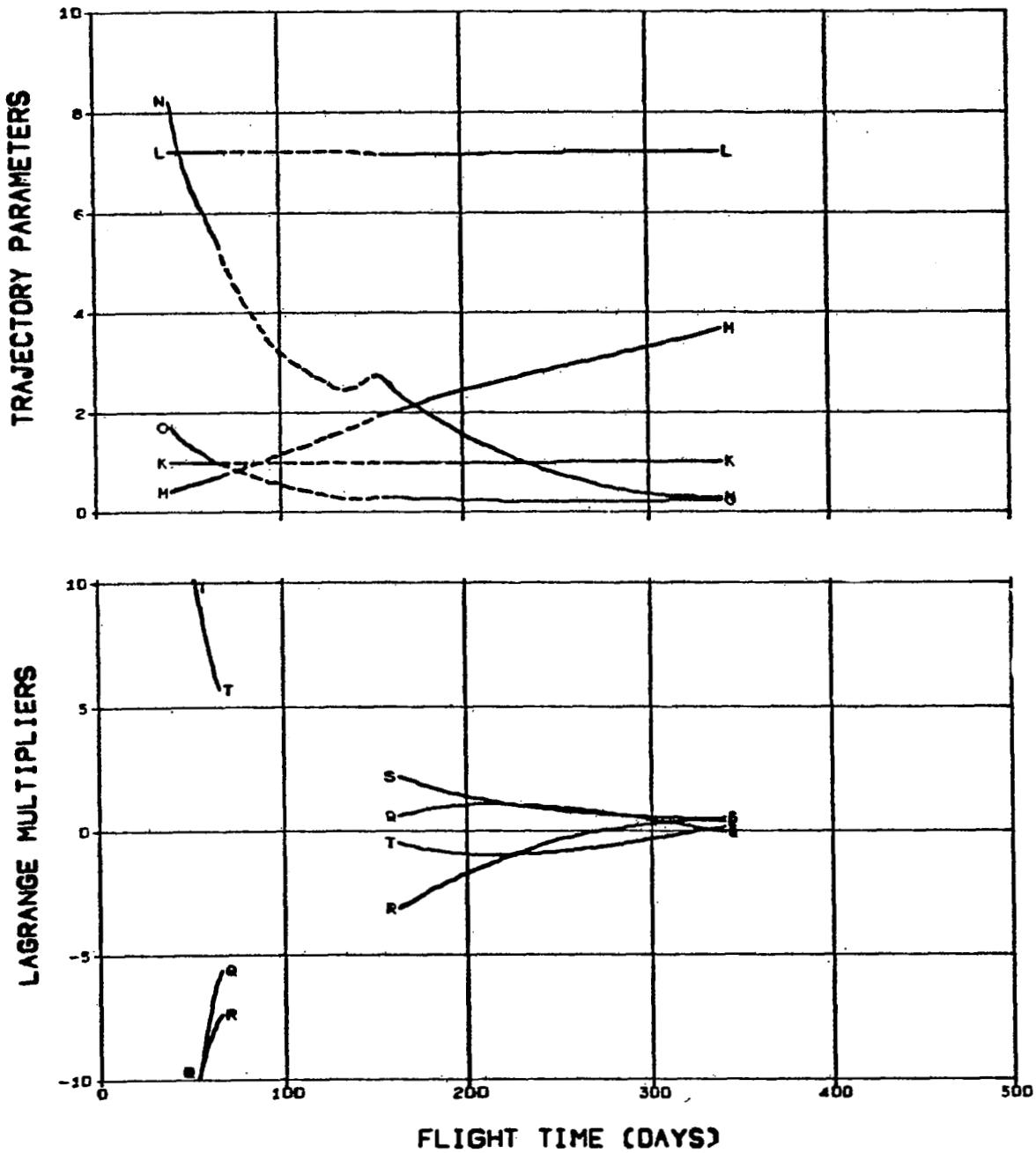


FIG. 2.1.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)
 G MAXIMUM POWER (KW)
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/100

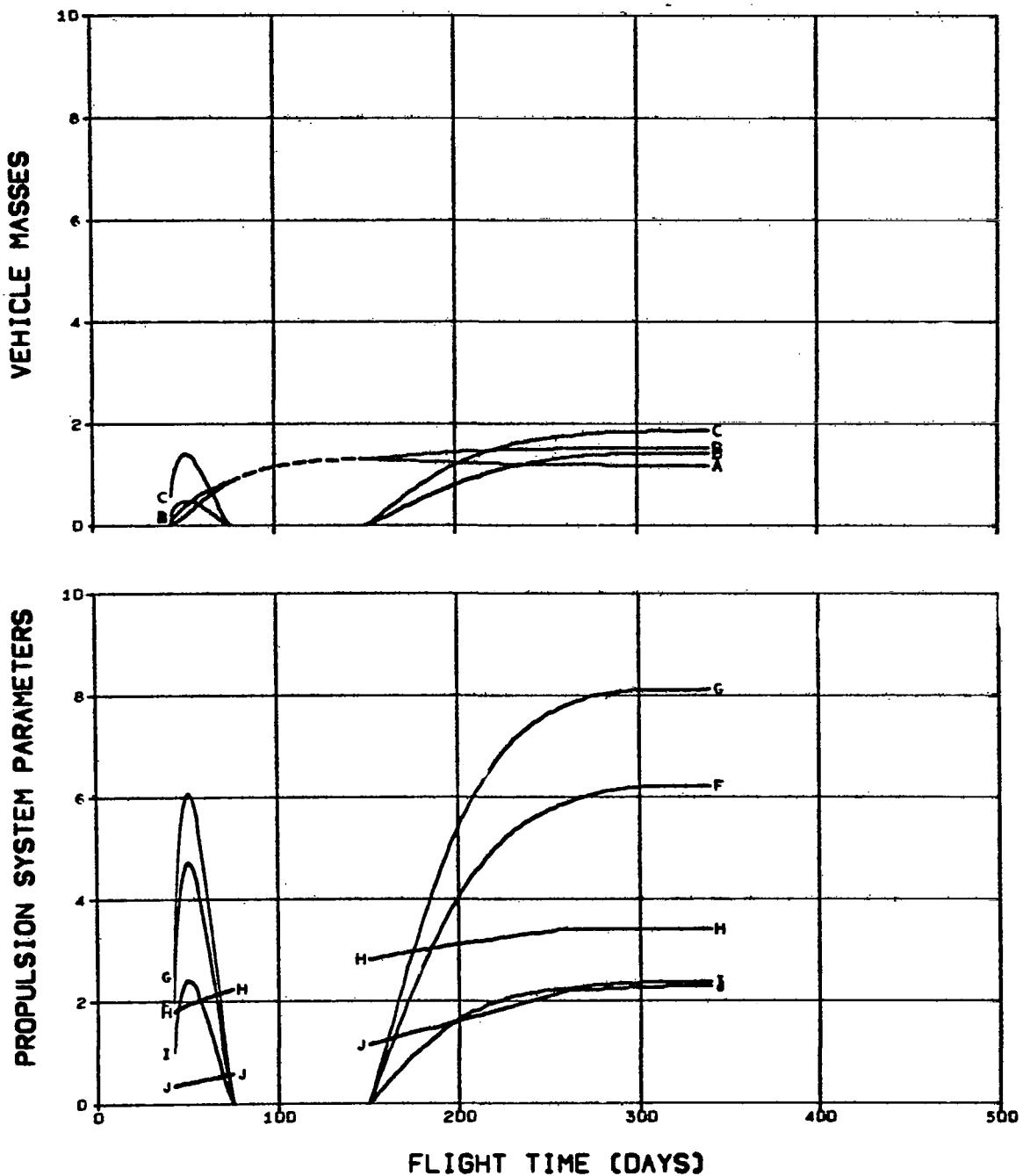


FIG. 2.1.6 VENUS MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEC)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

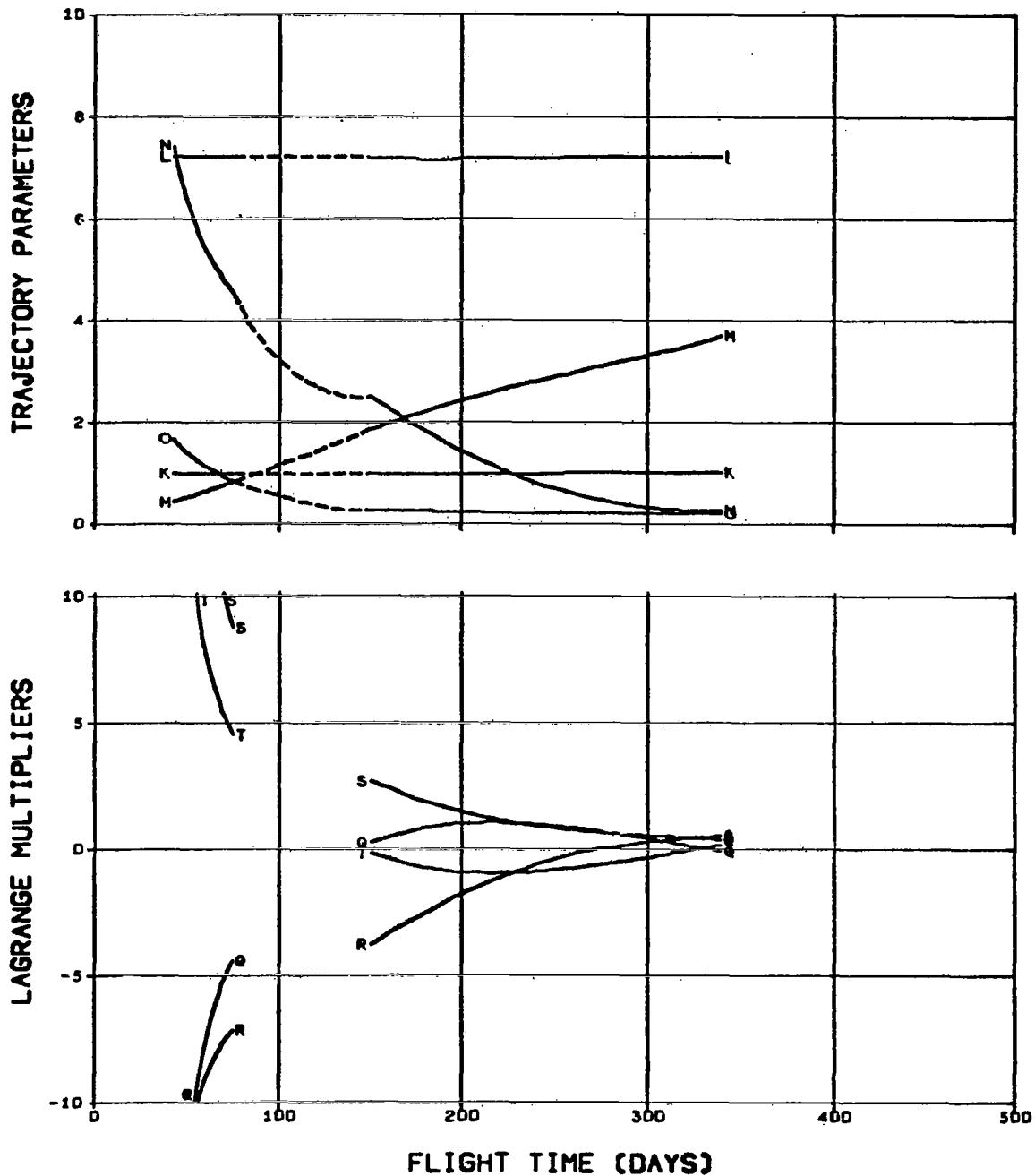


FIG. 2.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

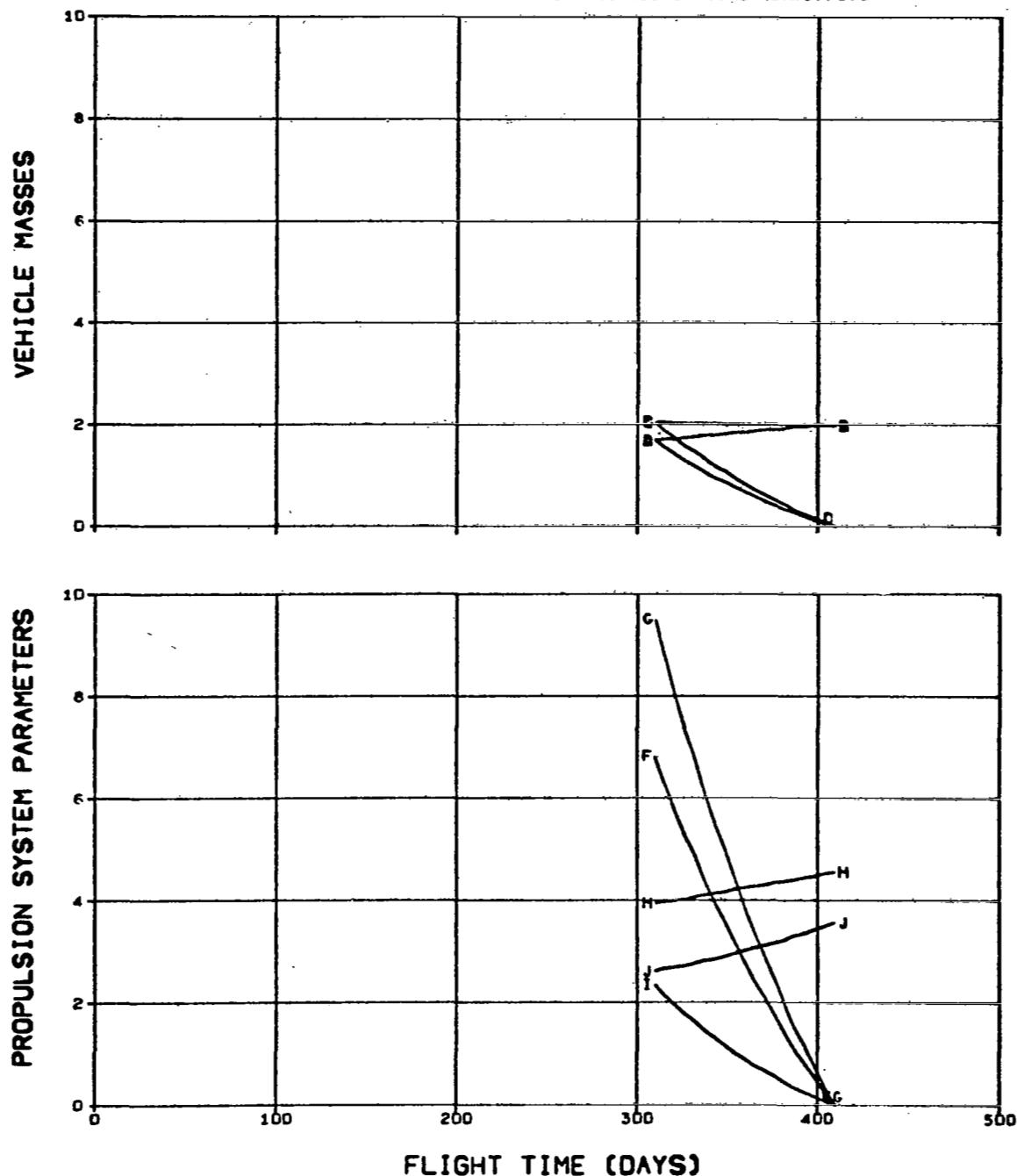


FIG. 2.2.1 VENUS MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.DOE-3
 L MINIMUM SOLAR DISTANCE (AU)/1.DOE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.DOE-2
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

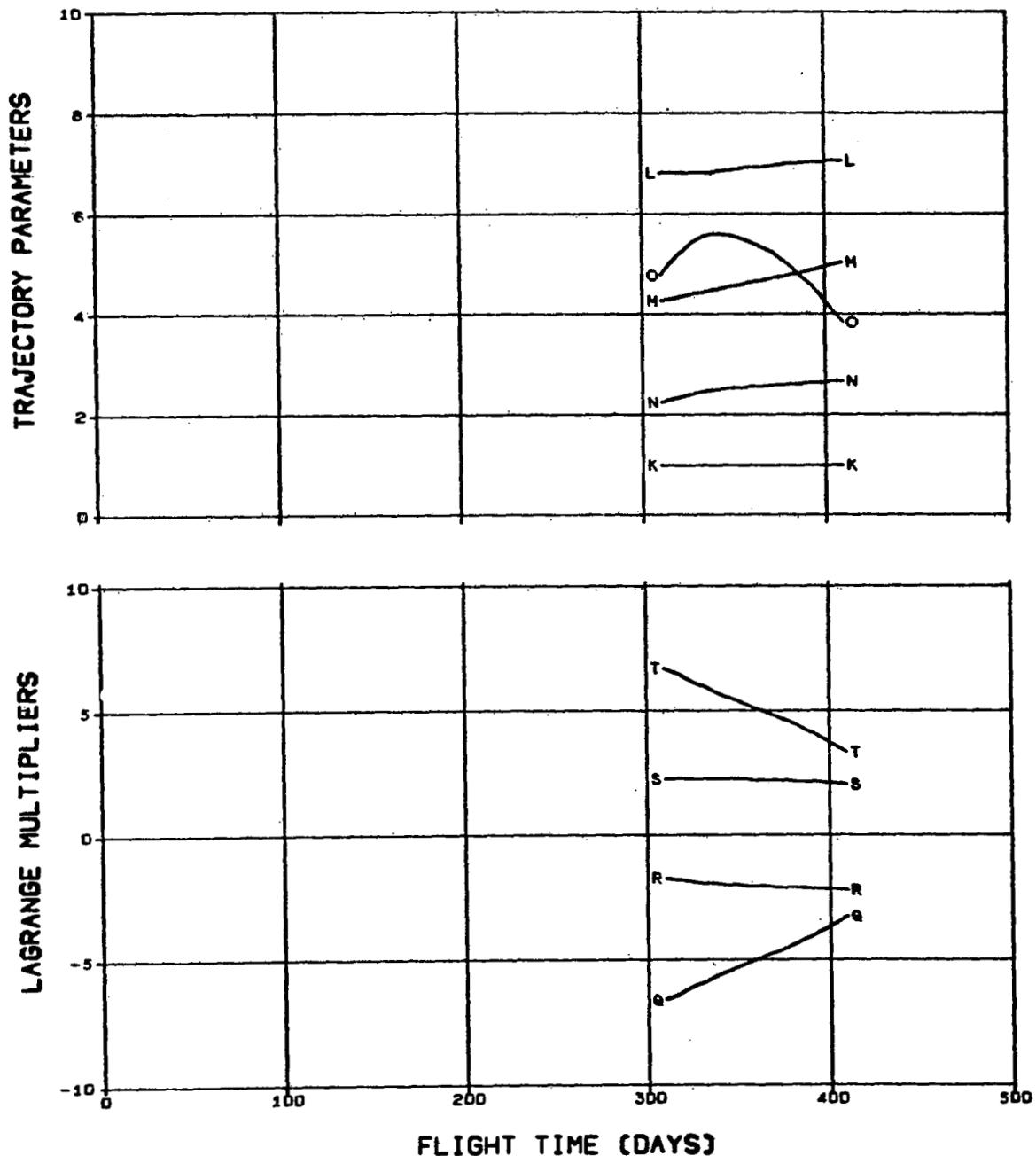


FIG. 2.2.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/100

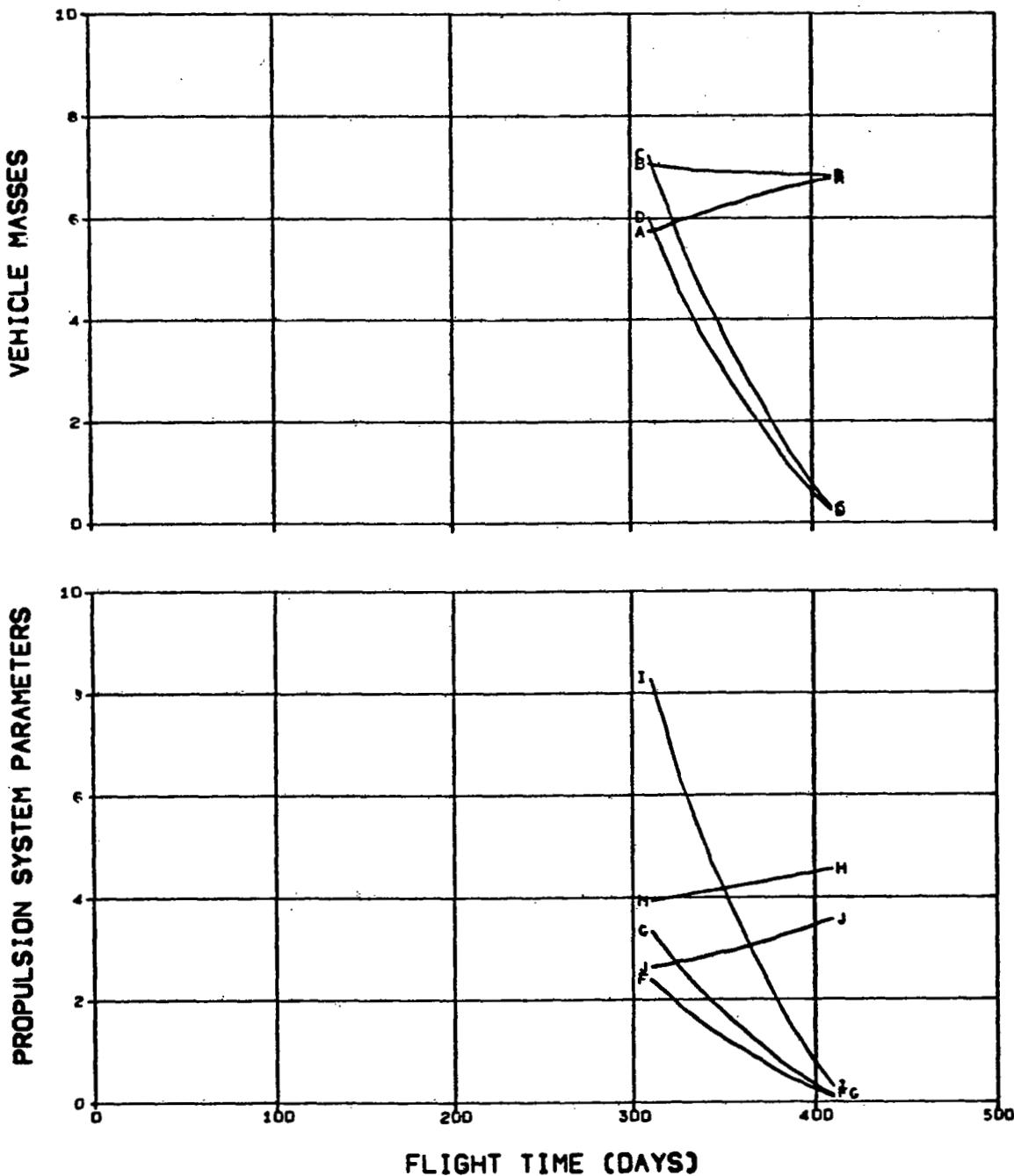


FIG. 2.2.2 VENUS MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

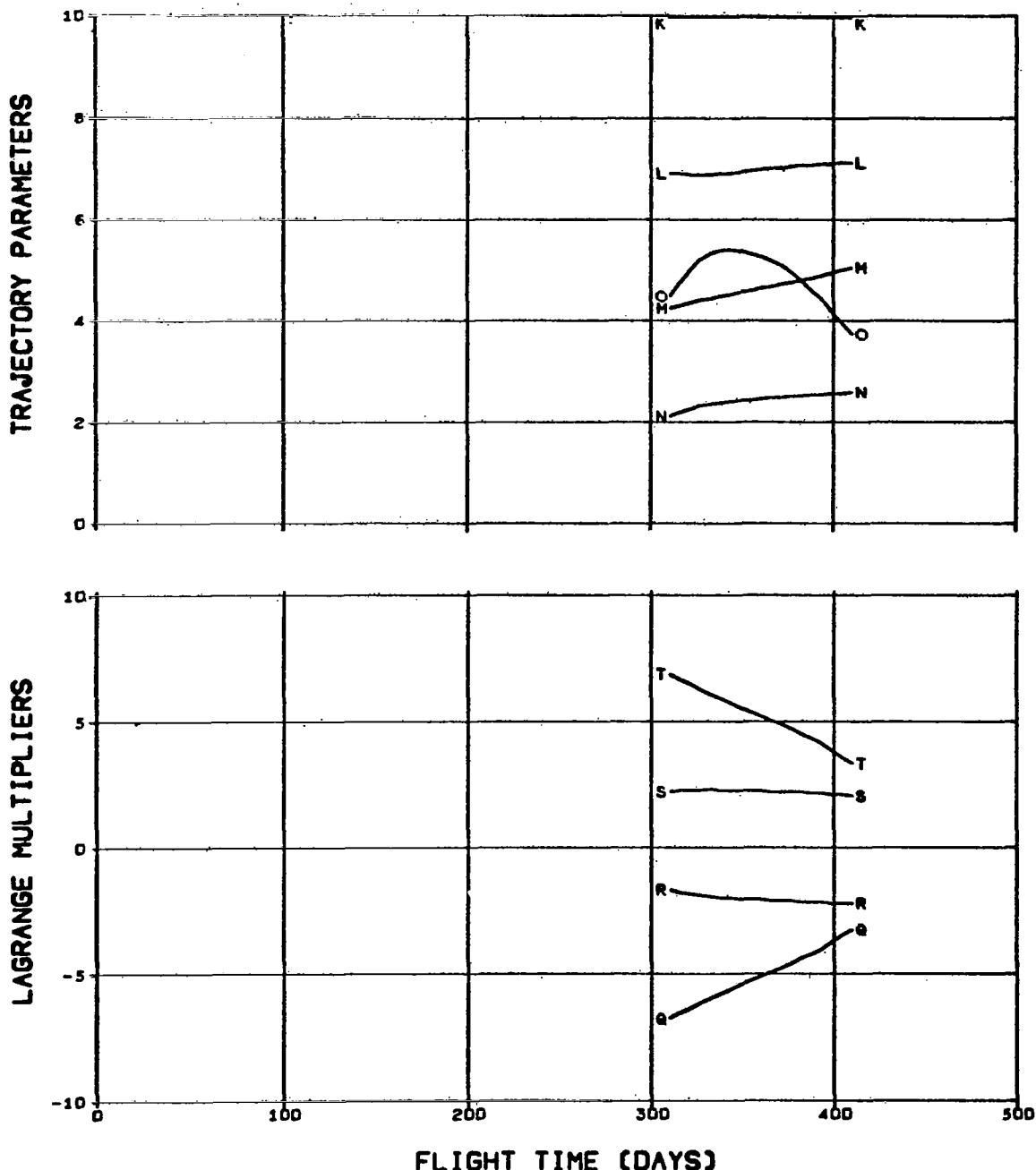
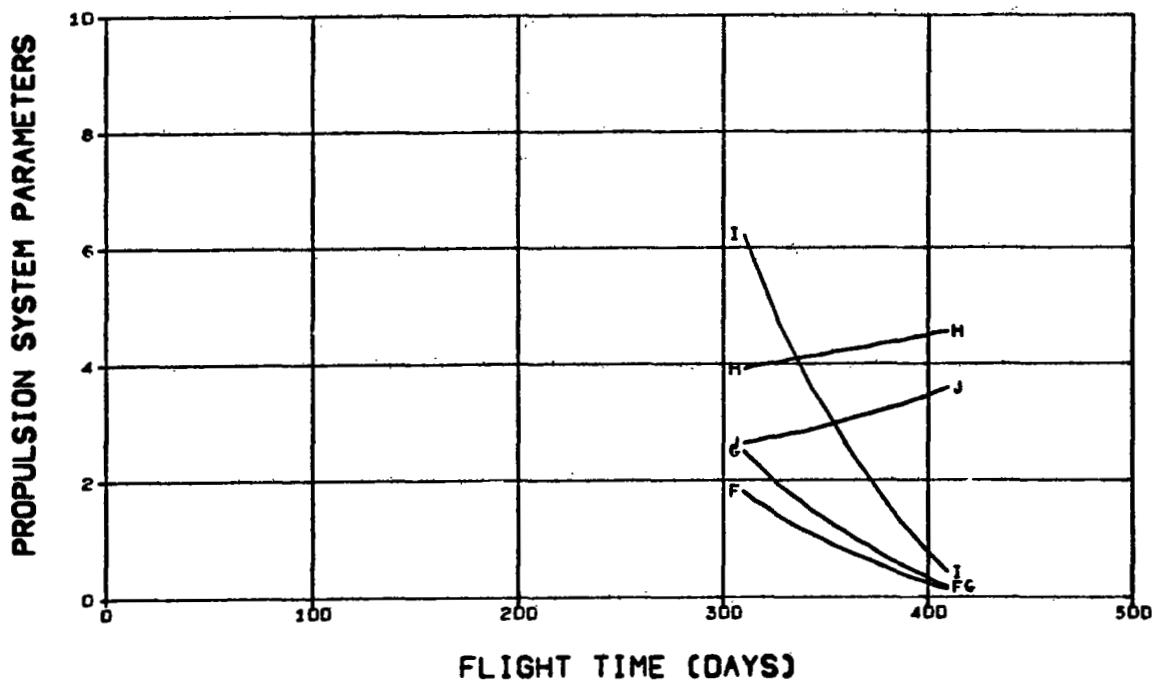
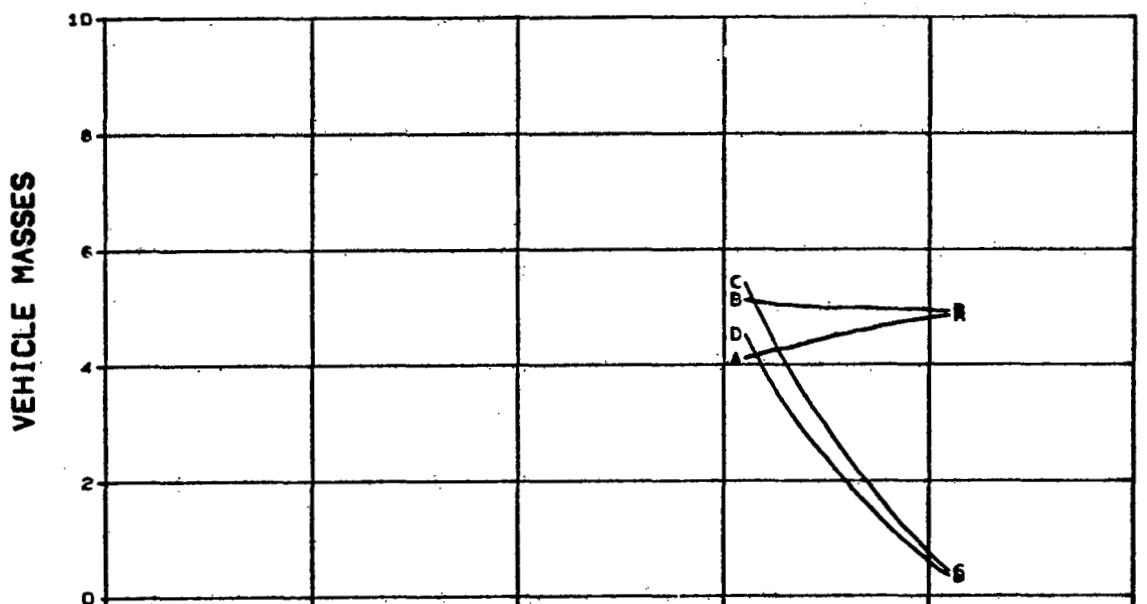


FIG. 2.2.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/100



**FIG. 2.2.3 VENUS MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE**

K MAXIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOPERTHIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

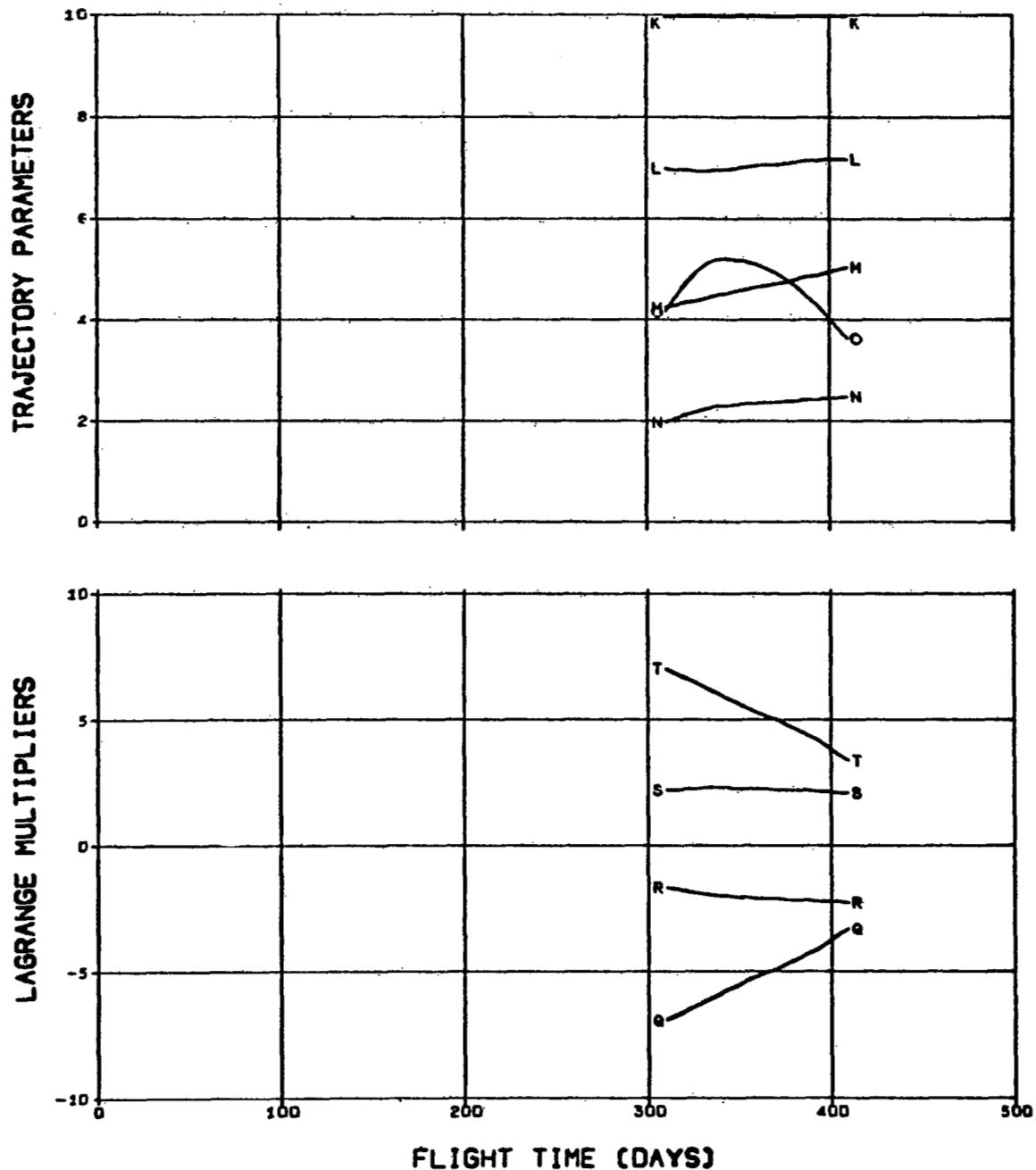


FIG. 2.2.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPELLION TIME (DAYS)/100

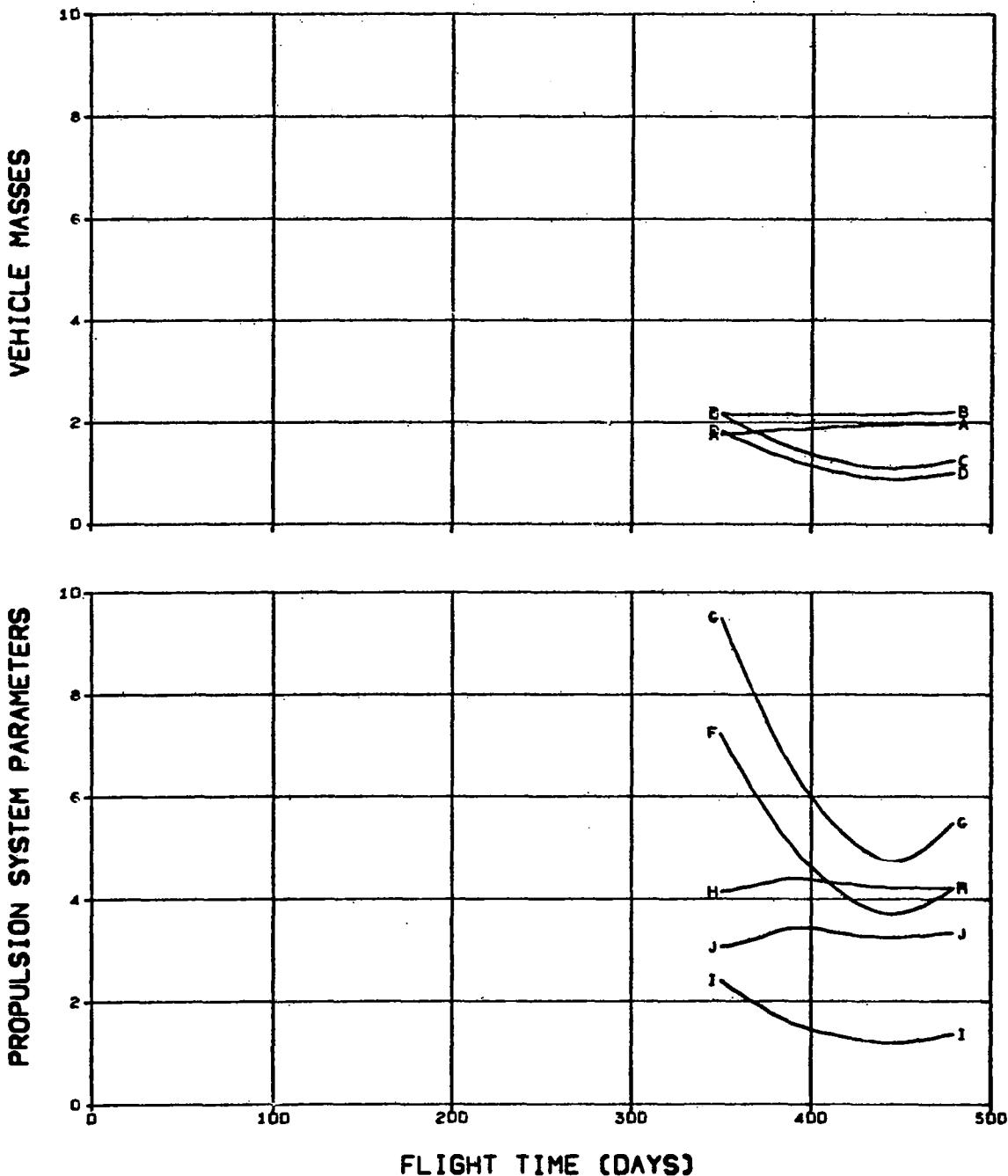


FIG. 2.2.4 VENUS MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) R X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 S Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 T X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 U Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

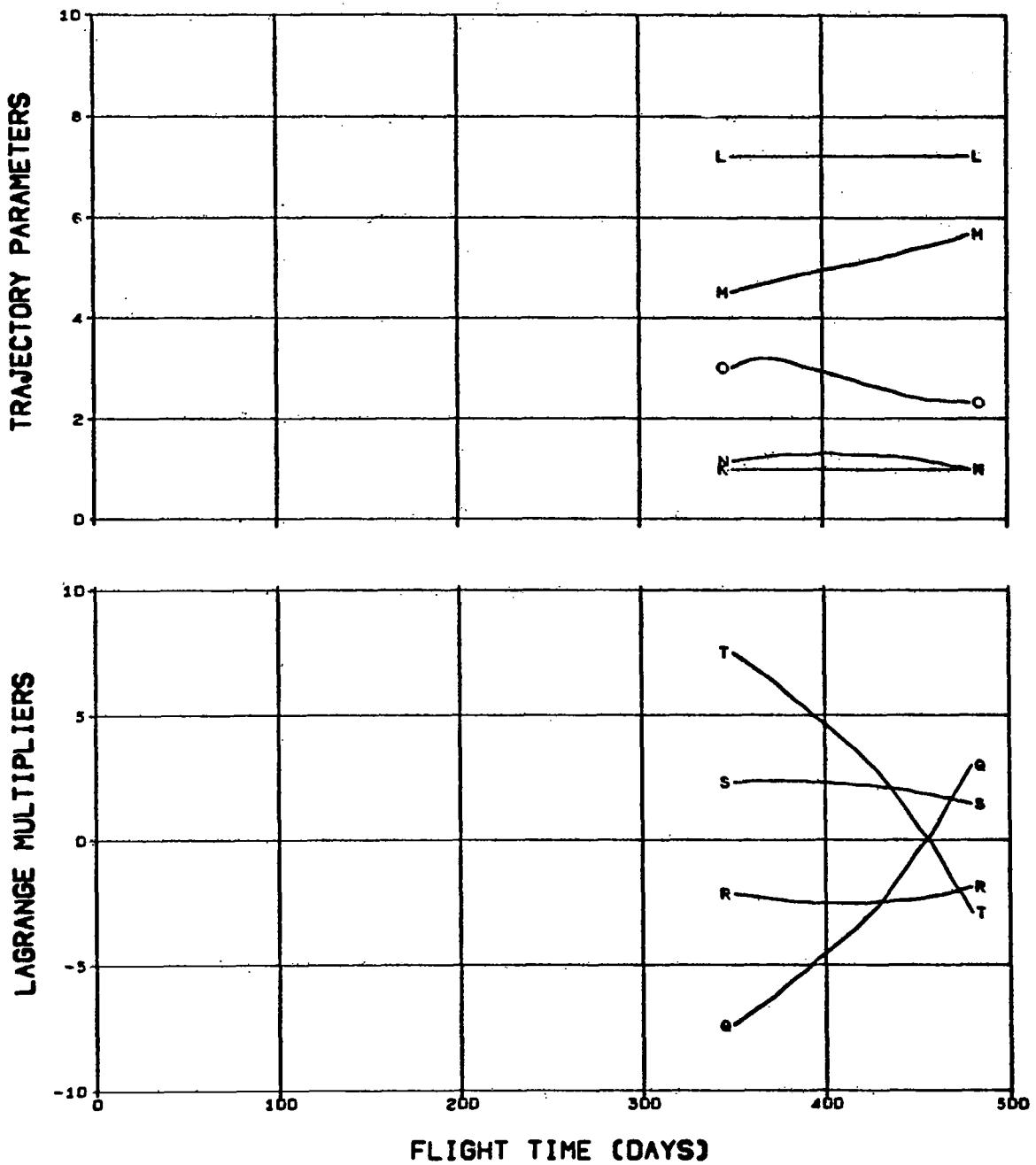


FIG. 2.2.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.00E-1
	J PROPULSION TIME (DAYS)/100

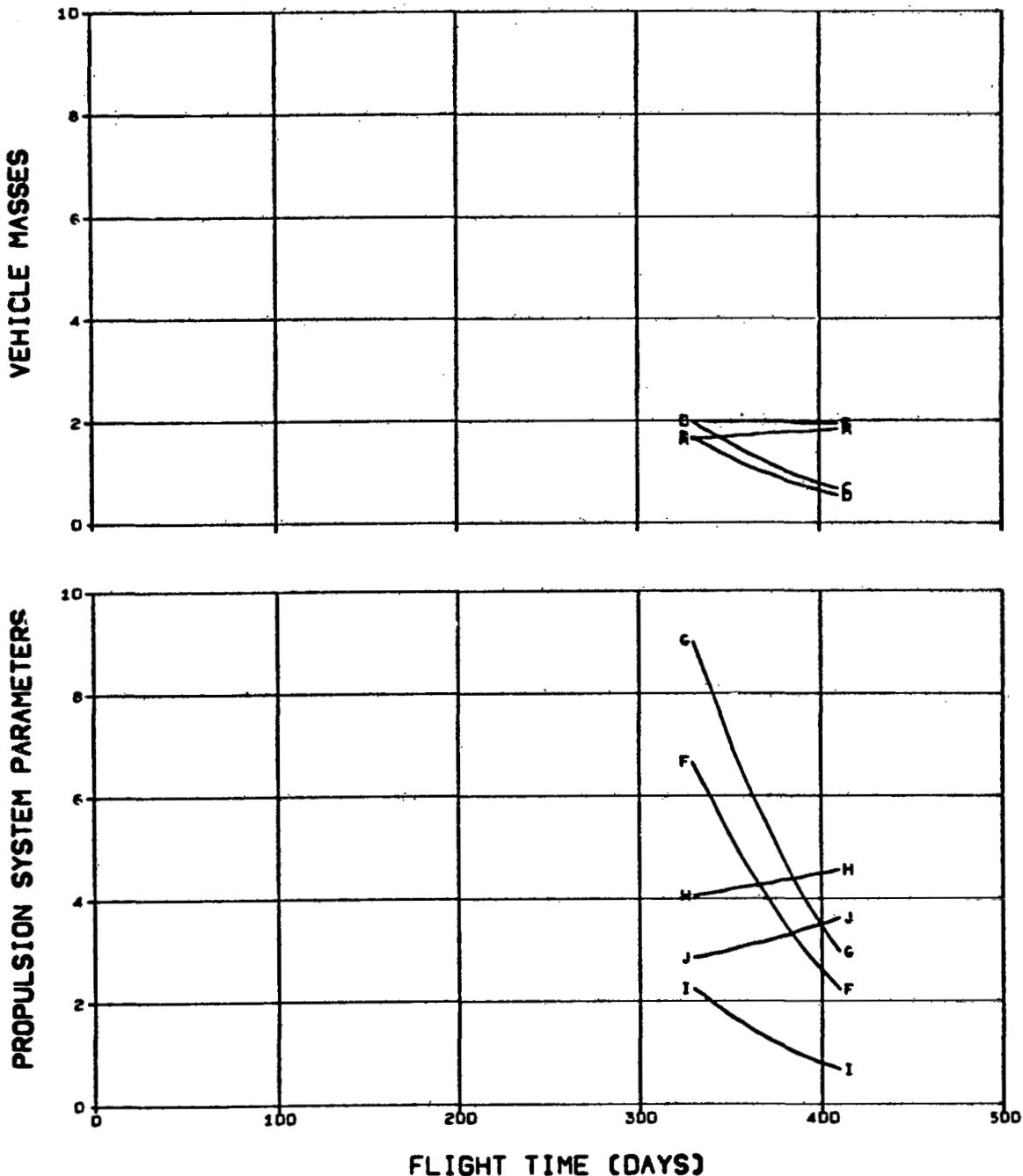


FIG. 2.2.5 VENUS MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPERIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

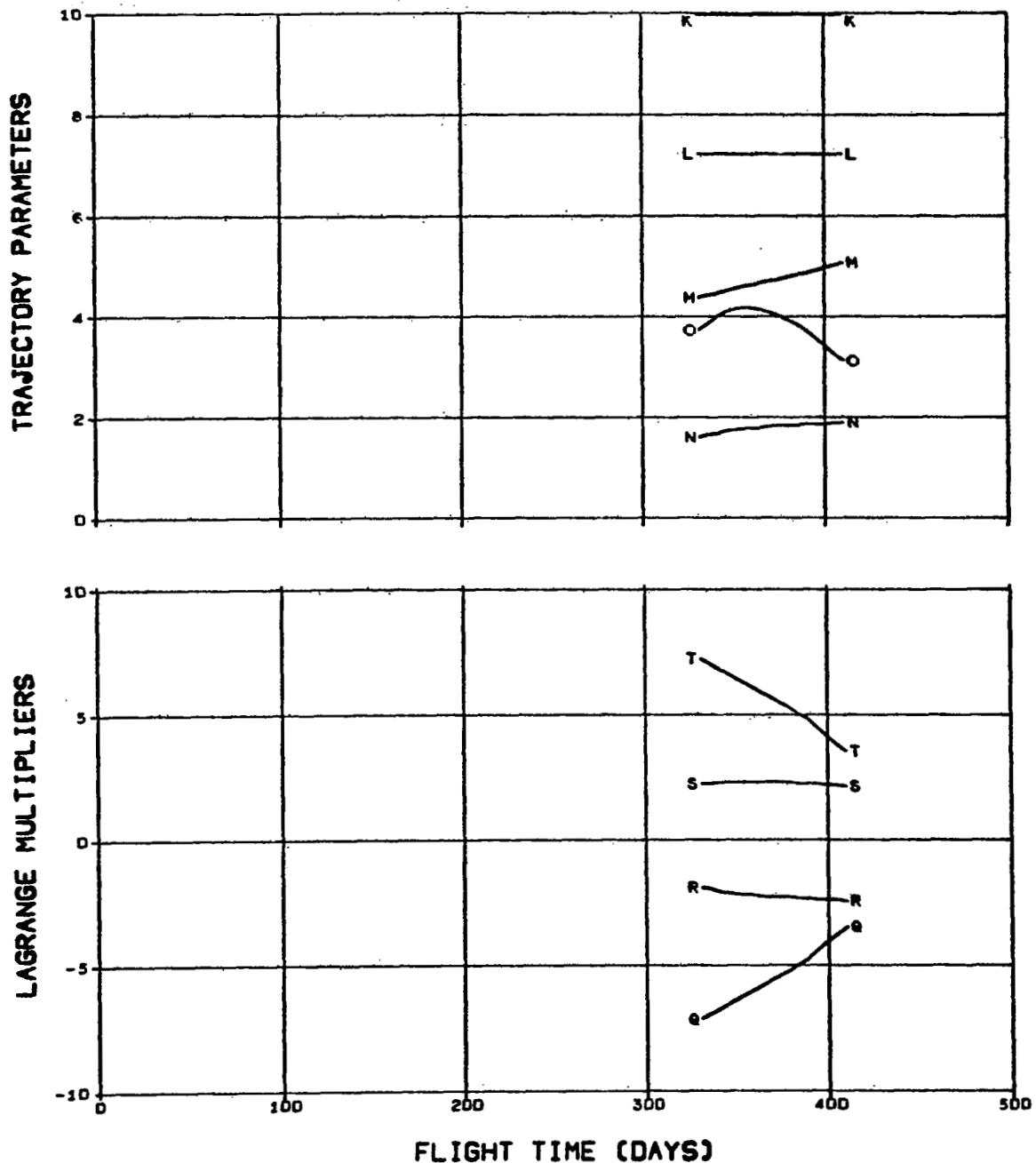


FIG. 2.2.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPELLUTION TIME (DAYS)/100

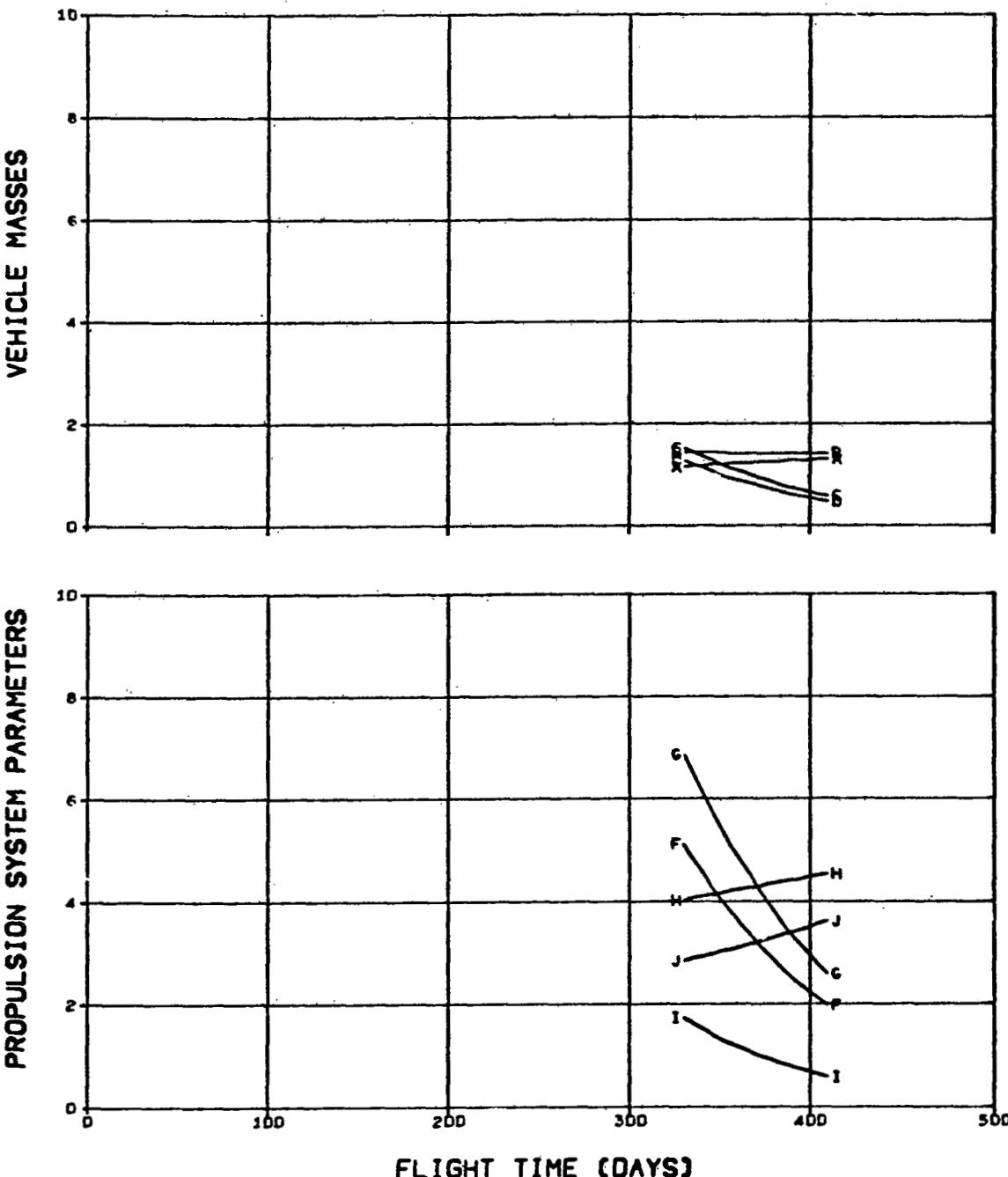


FIG. 2.2.6 VENUS MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
H	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

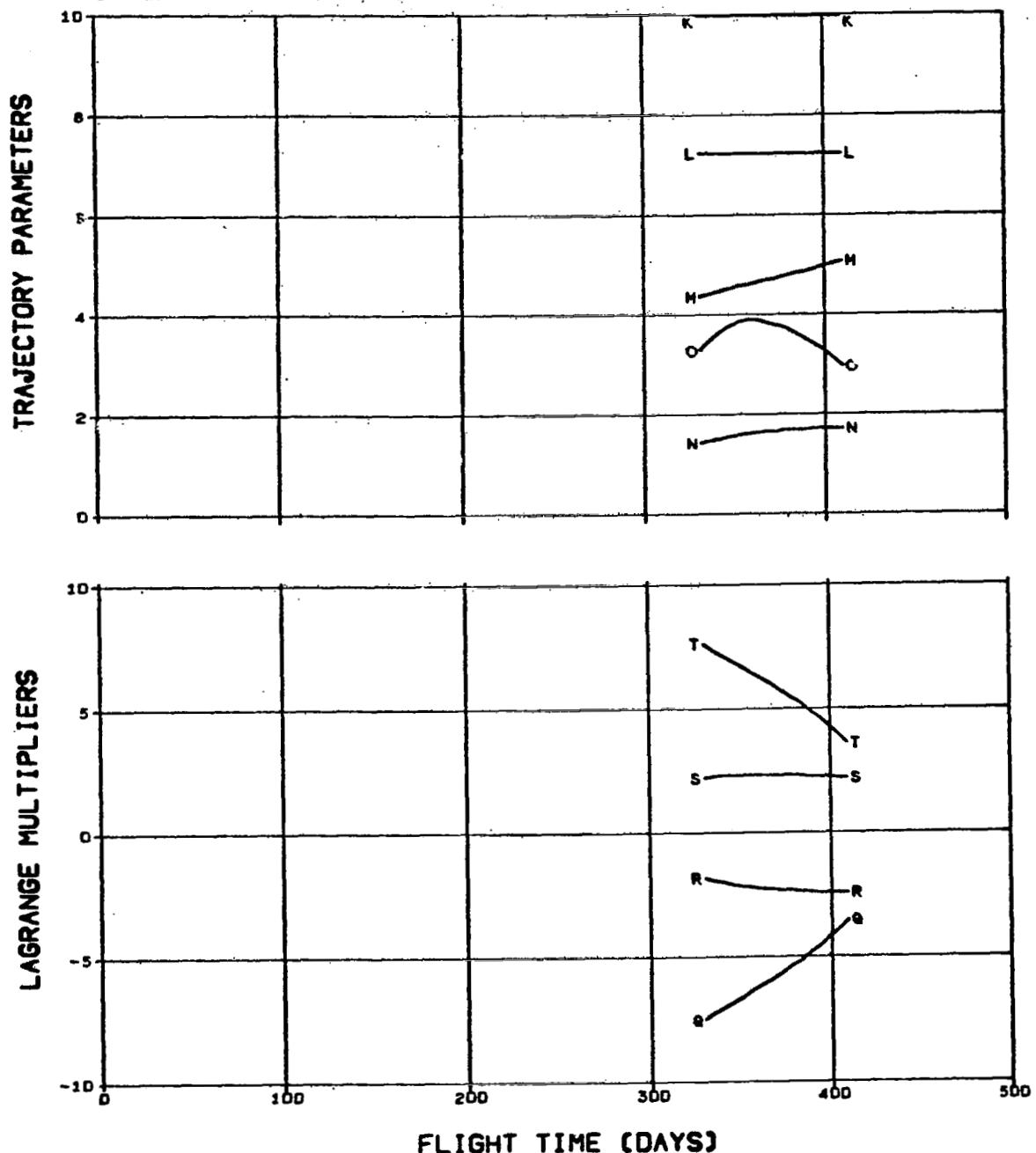
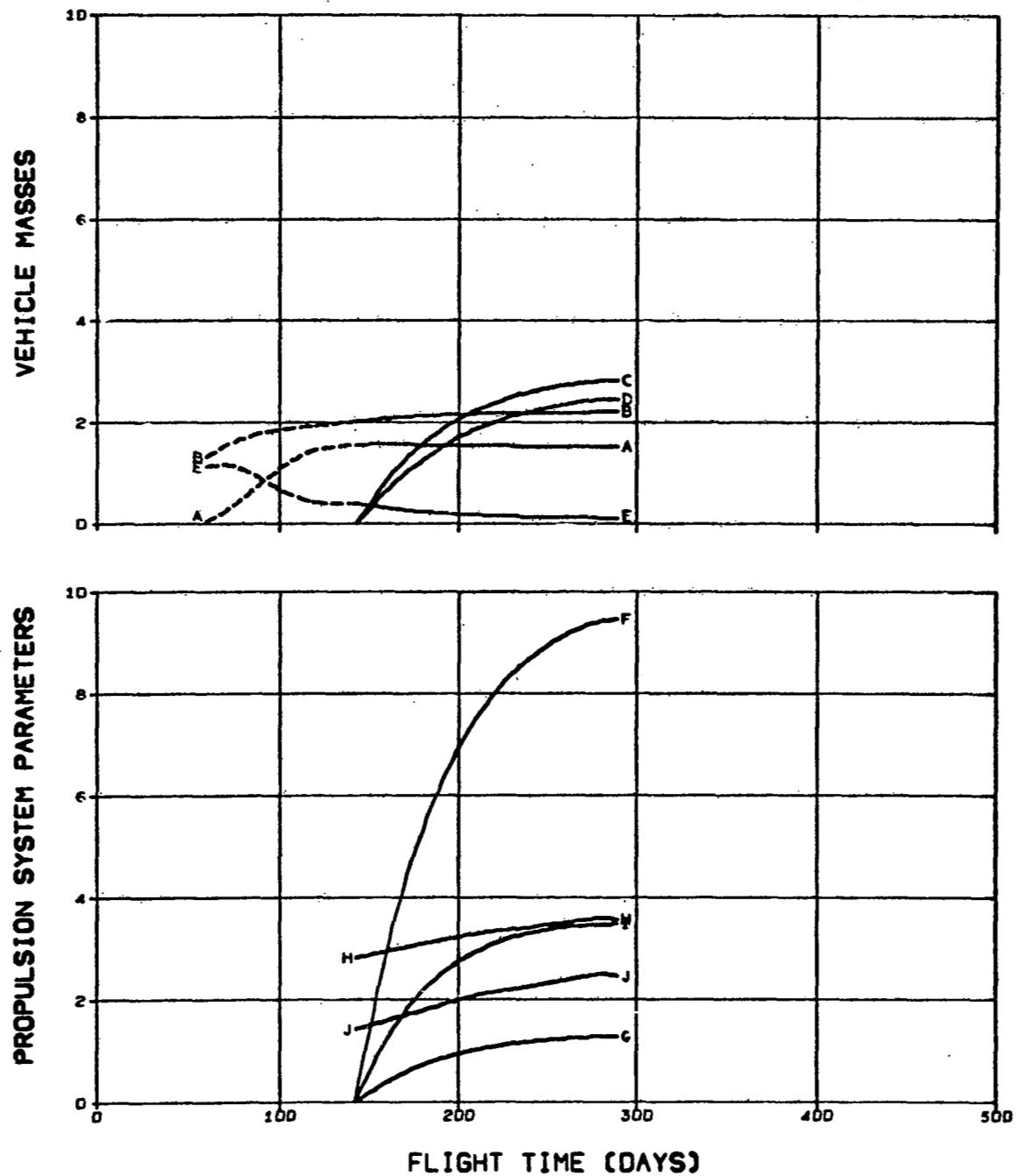


FIG. 2.2.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/10000	J	PROPULSION TIME (DAYS)/100



**FIG. 2.3.1 VENUS MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

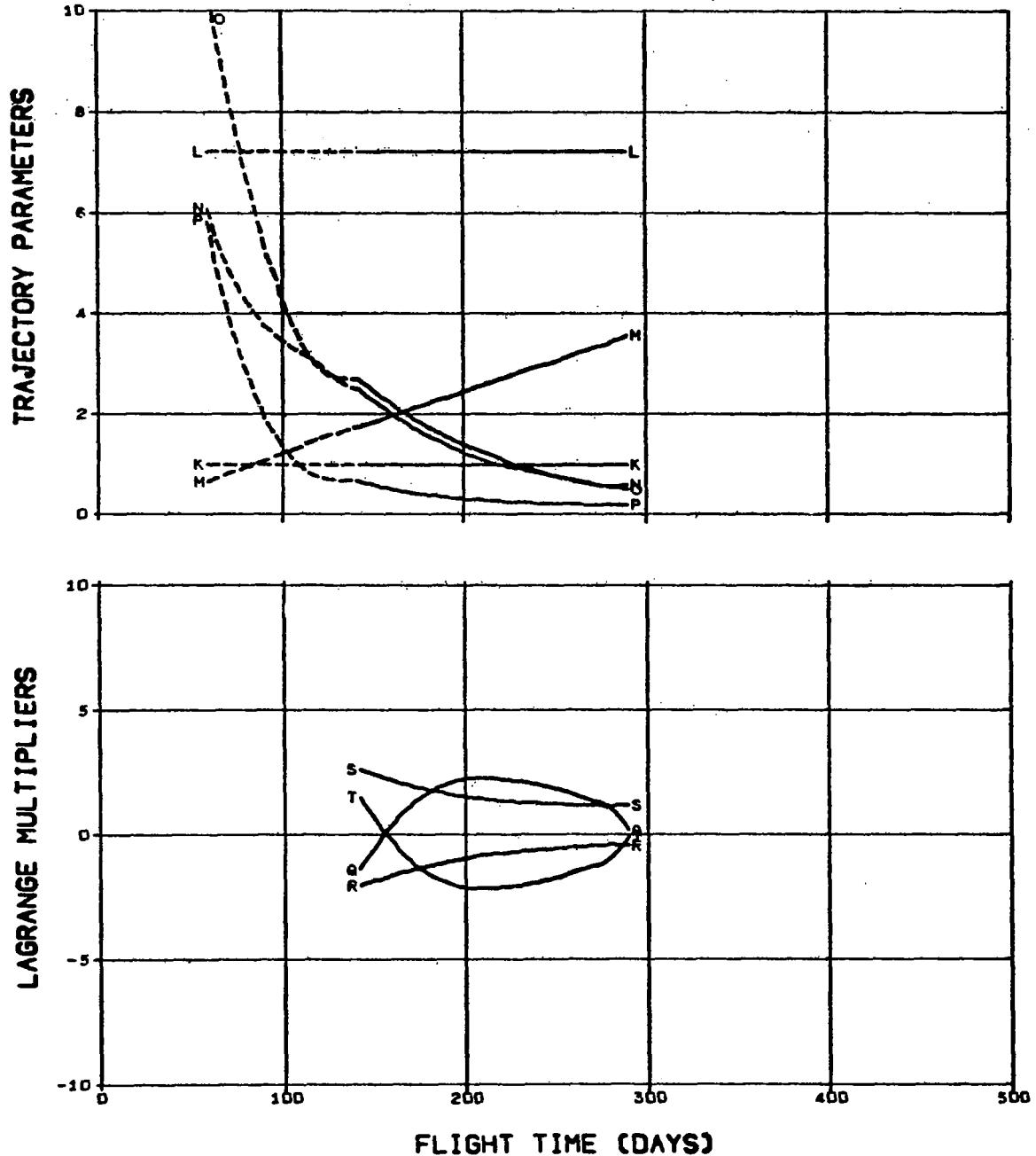


FIG. 2.3.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/100

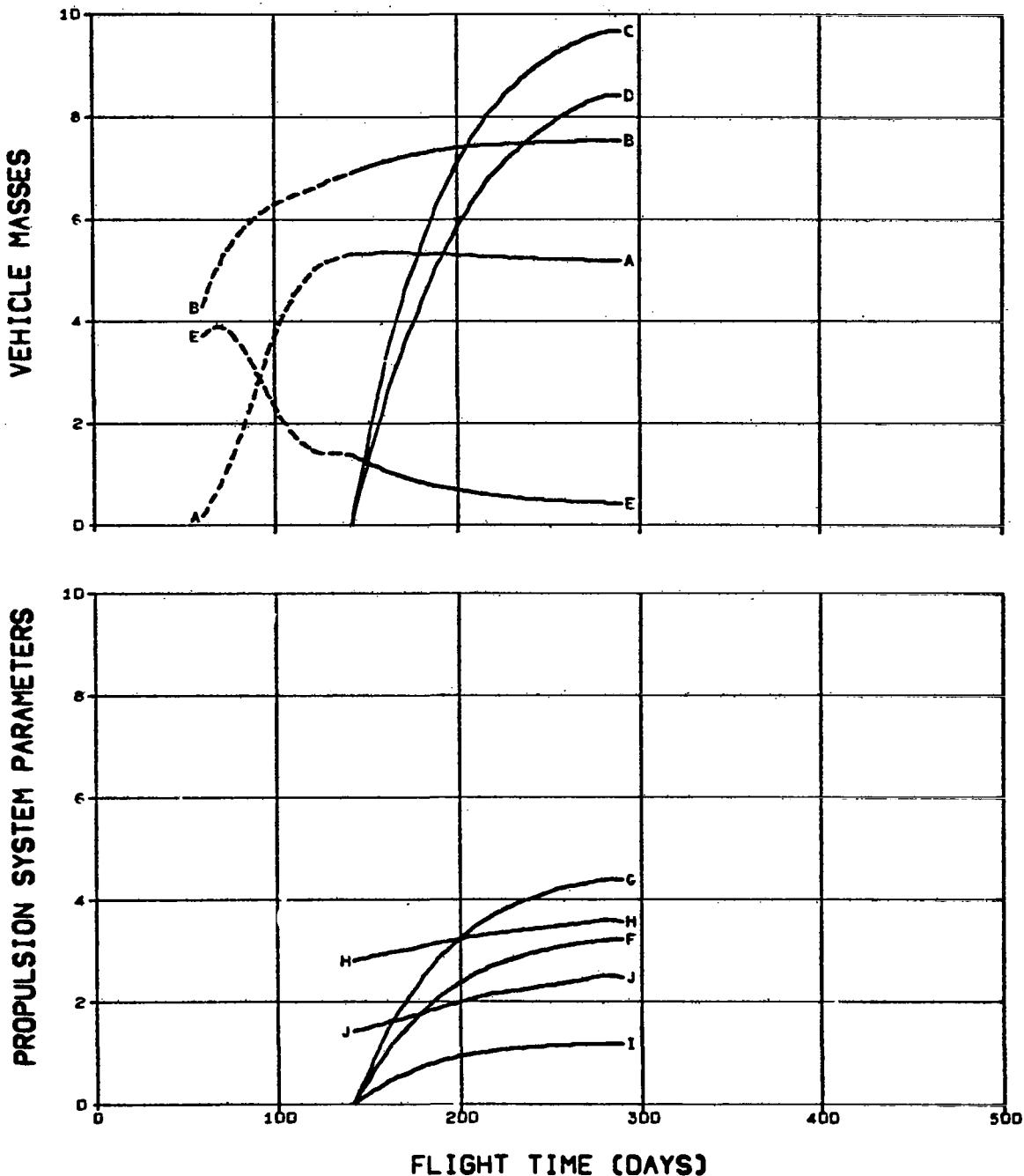


FIG. 2.3.2 VENUS MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K. MAXIMUM SOLAR DISTANCE (AU)	P. RETRO INCREMENTAL SPEED (M/SEC)/1000
L. MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q. X-COMPONENT OF PRIMER/1.0DE-1
M. HELIOCENTRIC TRAVEL ANGLE (DEC)/100	R. Y-COMPONENT OF PRIMER
N. LAUNCH EXCESS SPEED (M/SEC)/1000	S. X-COMPONENT OF PRIMER DERIVATIVE
O. ARRIVAL EXCESS SPEED (M/SEC)/1000	T. Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

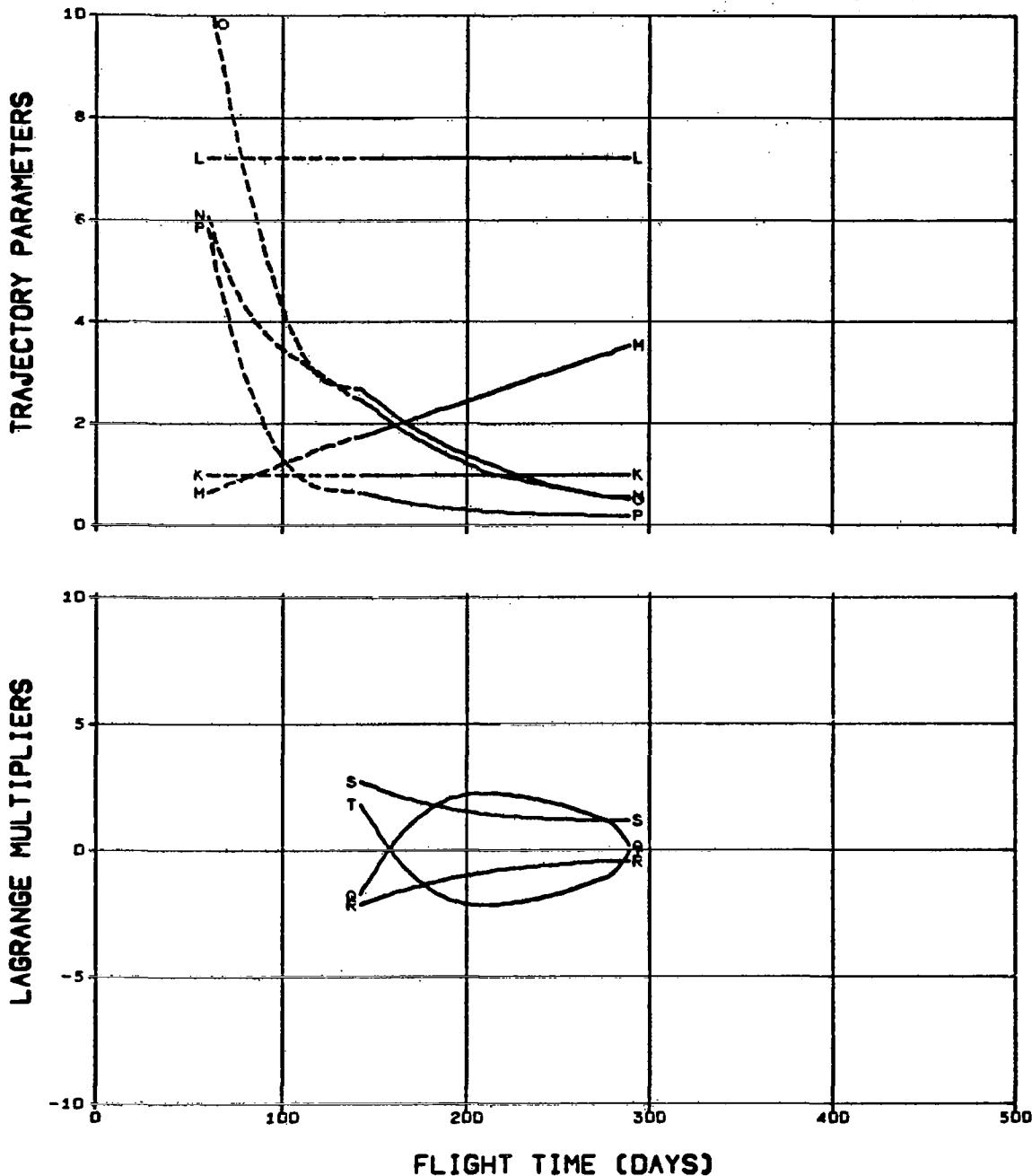
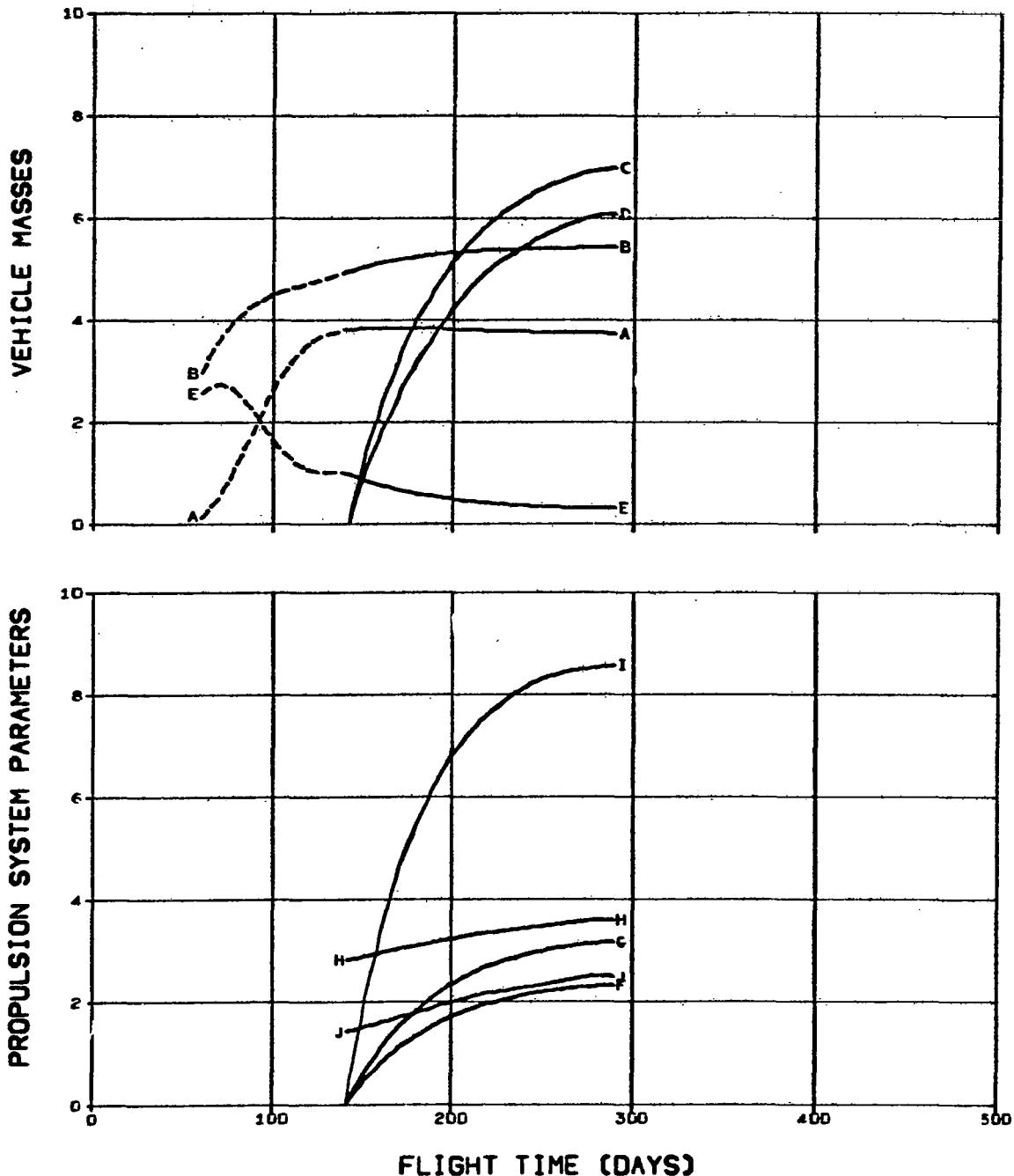


FIG. 2.3.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/100



**FIG. 2.3.3 VENUS MODE A ORBITER MISSIONS
TITAN III XC1205/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

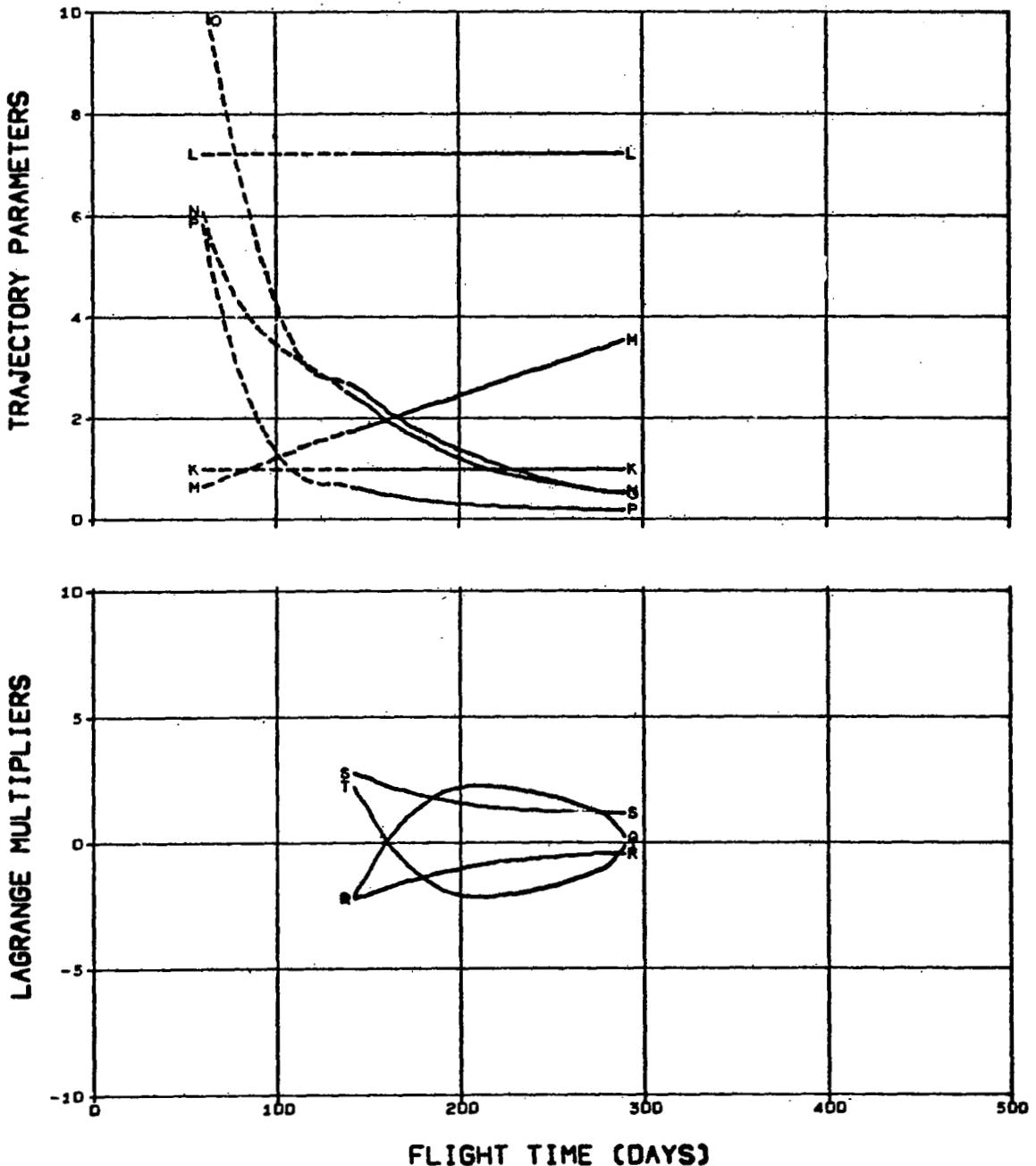


FIG. 2.3.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100

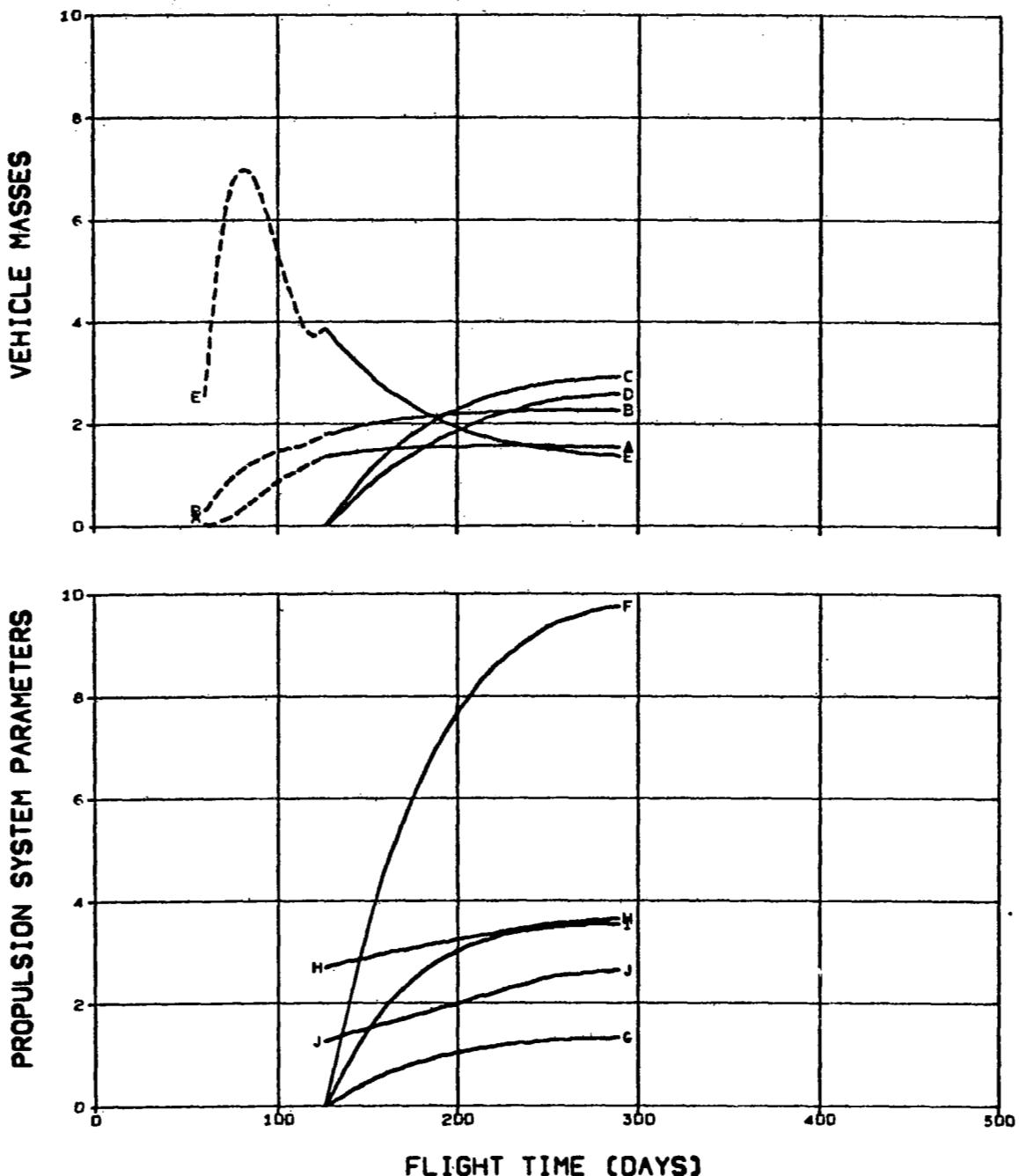


FIG. 2.3.4 VENUS MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

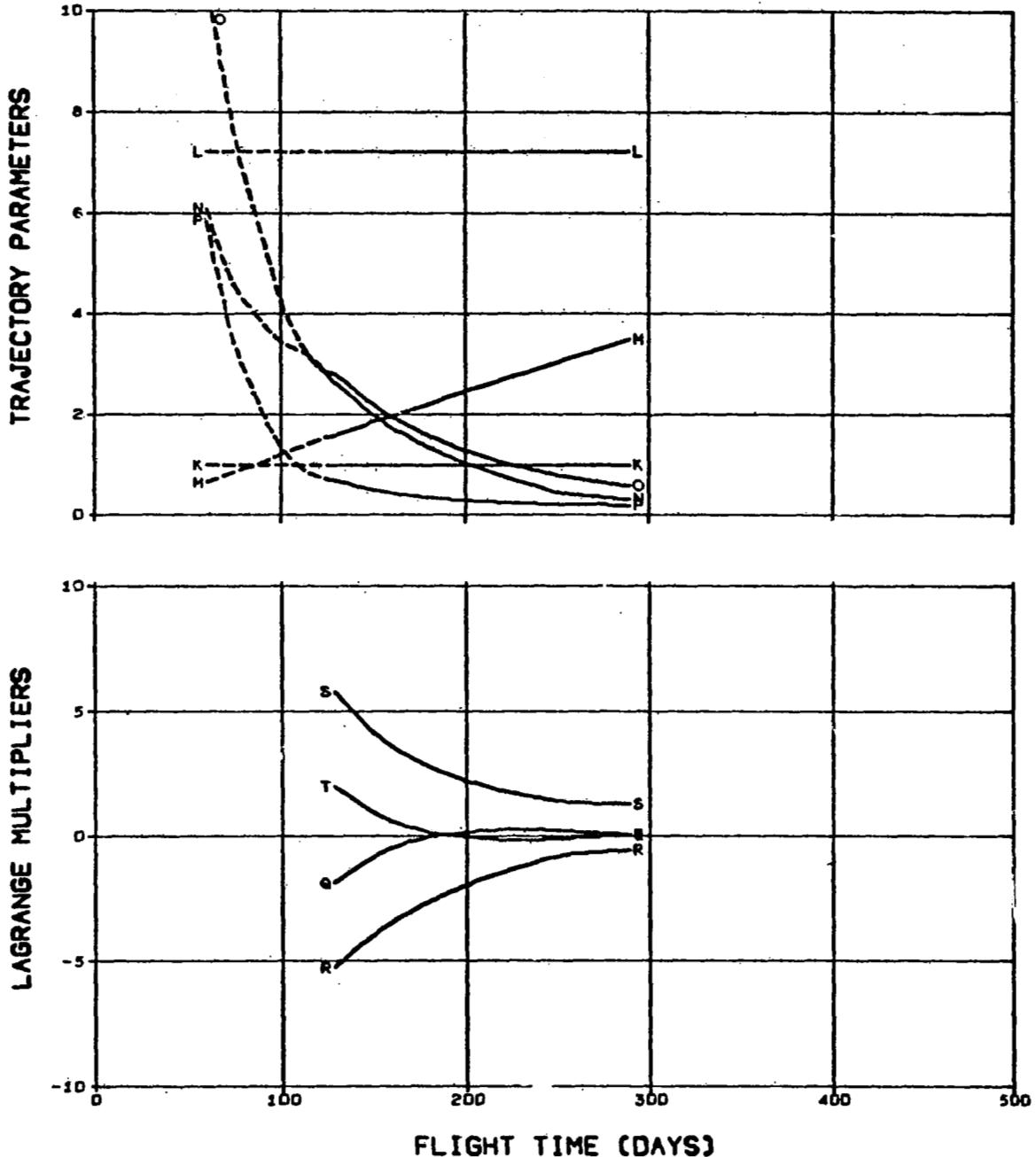
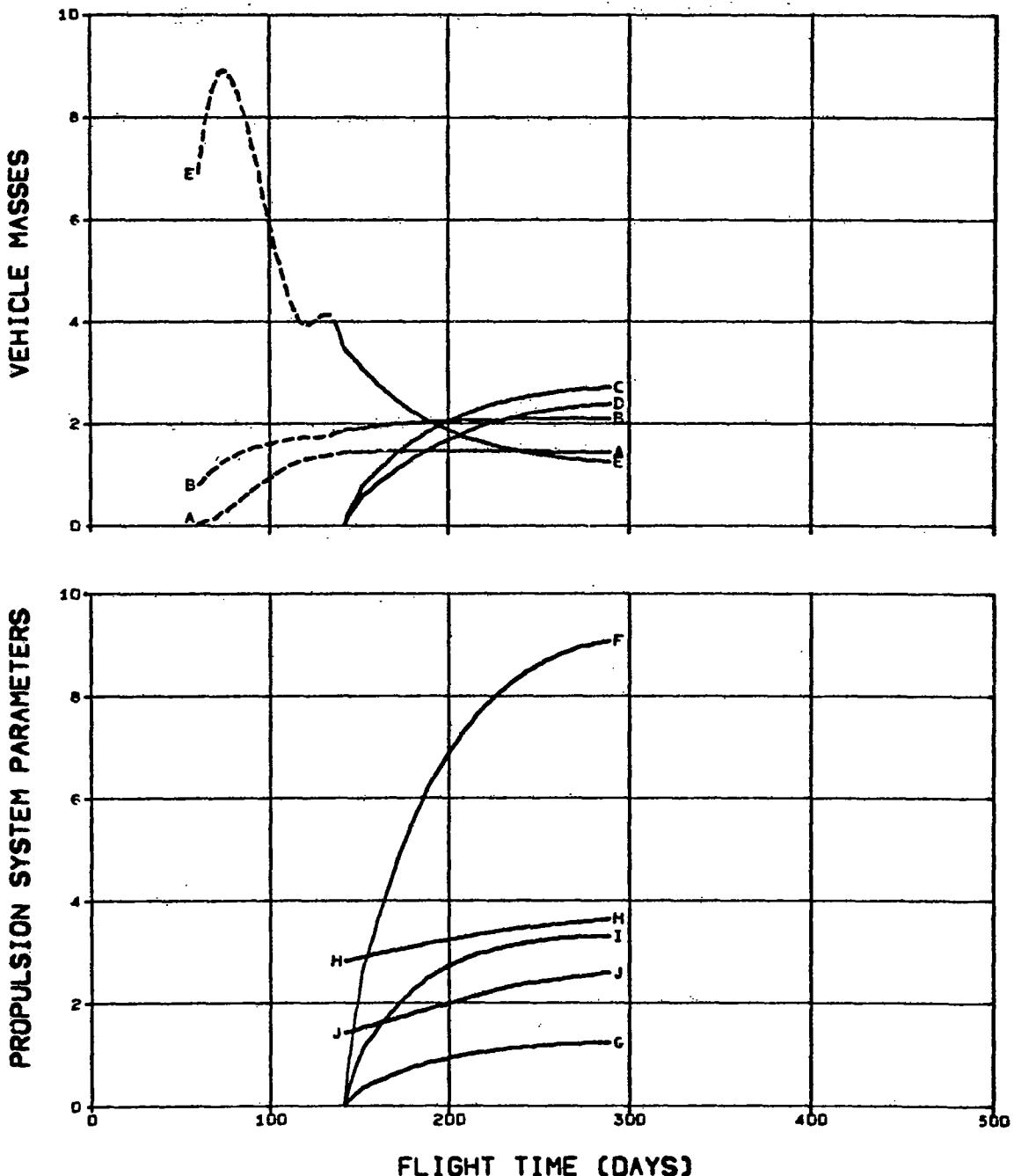


FIG. 2.3.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 2.3.5 VENUS MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

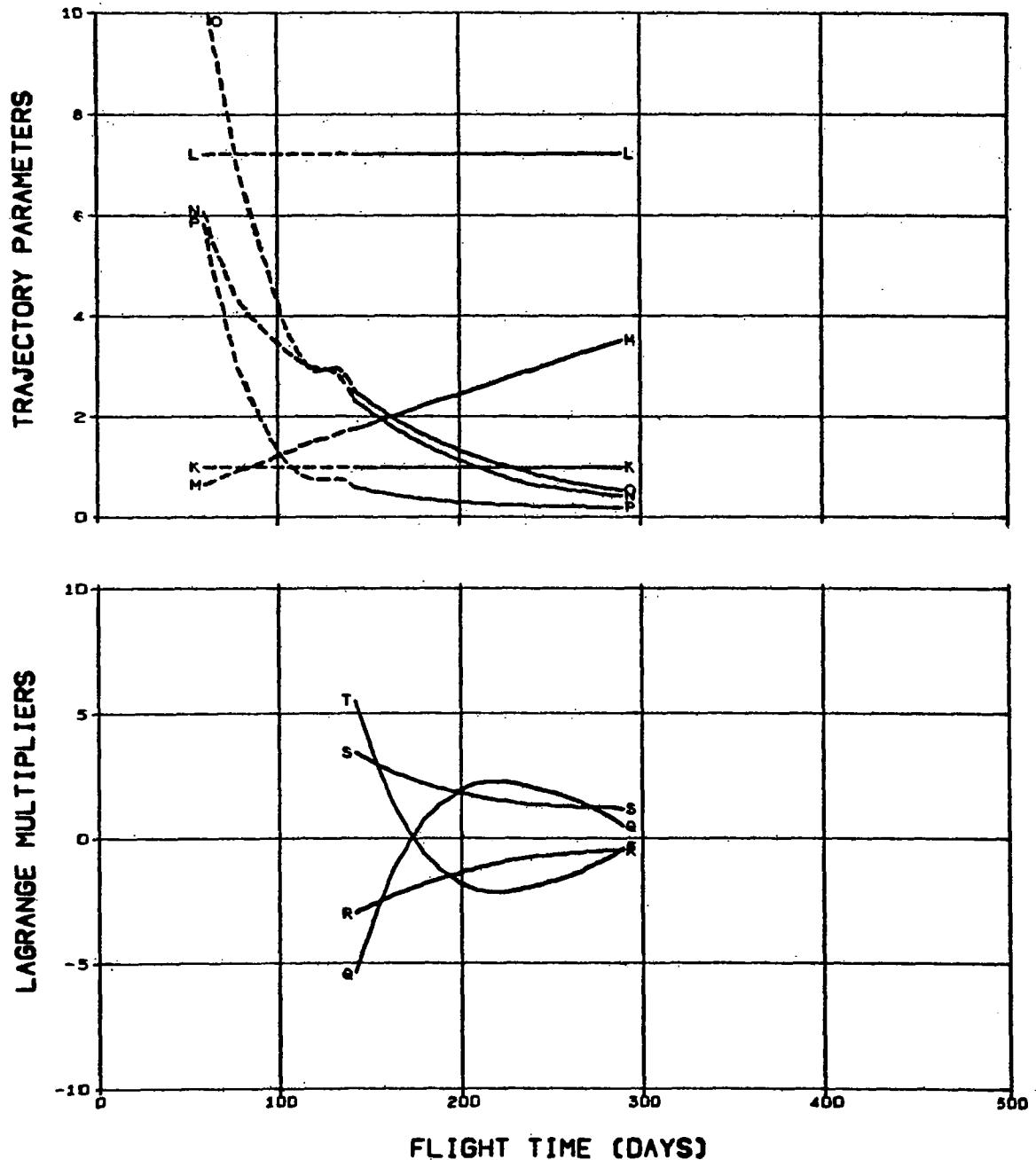
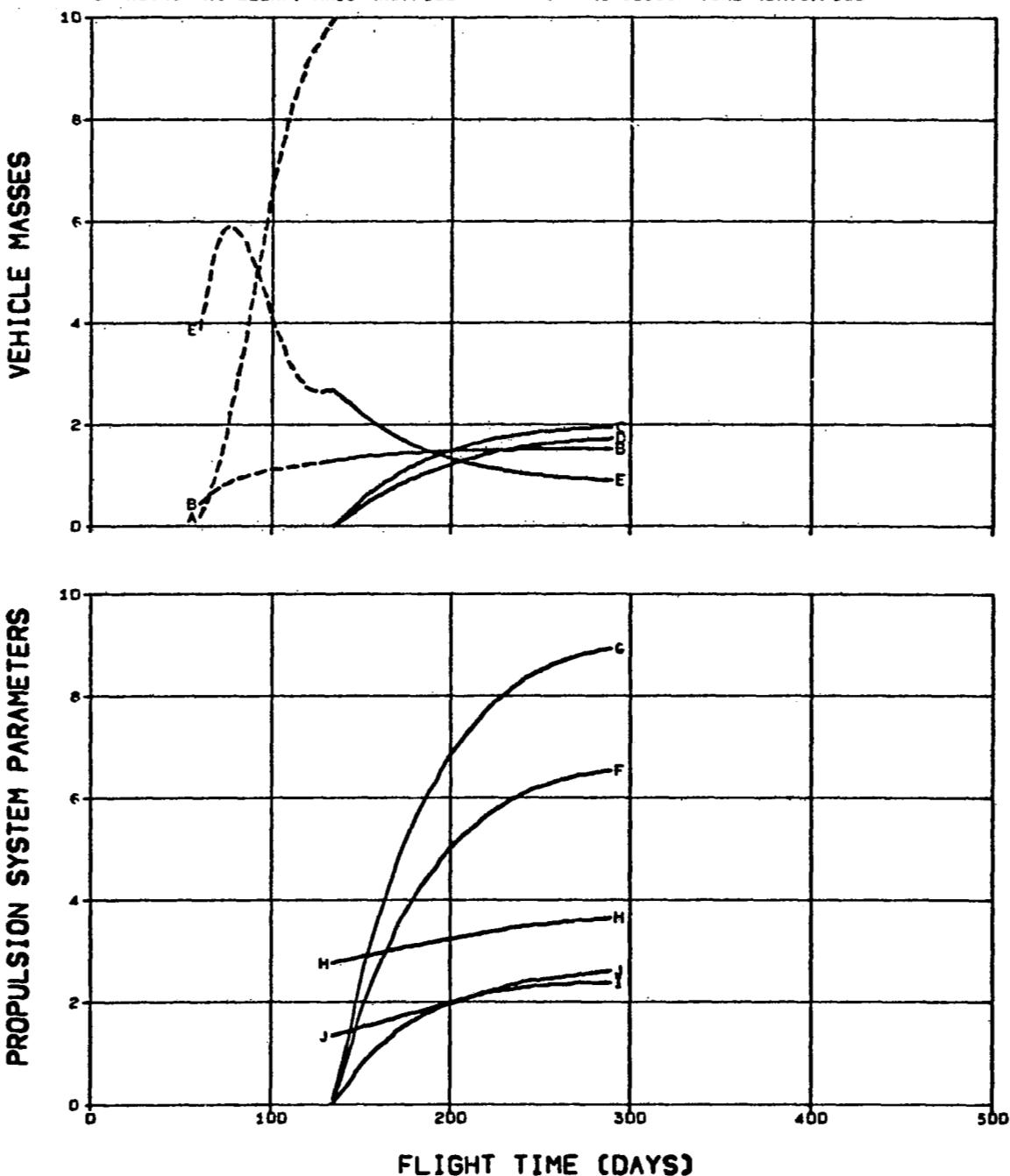


FIG. 2.3.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1,00E-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/100



**FIG. 2.3.6 VENUS MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

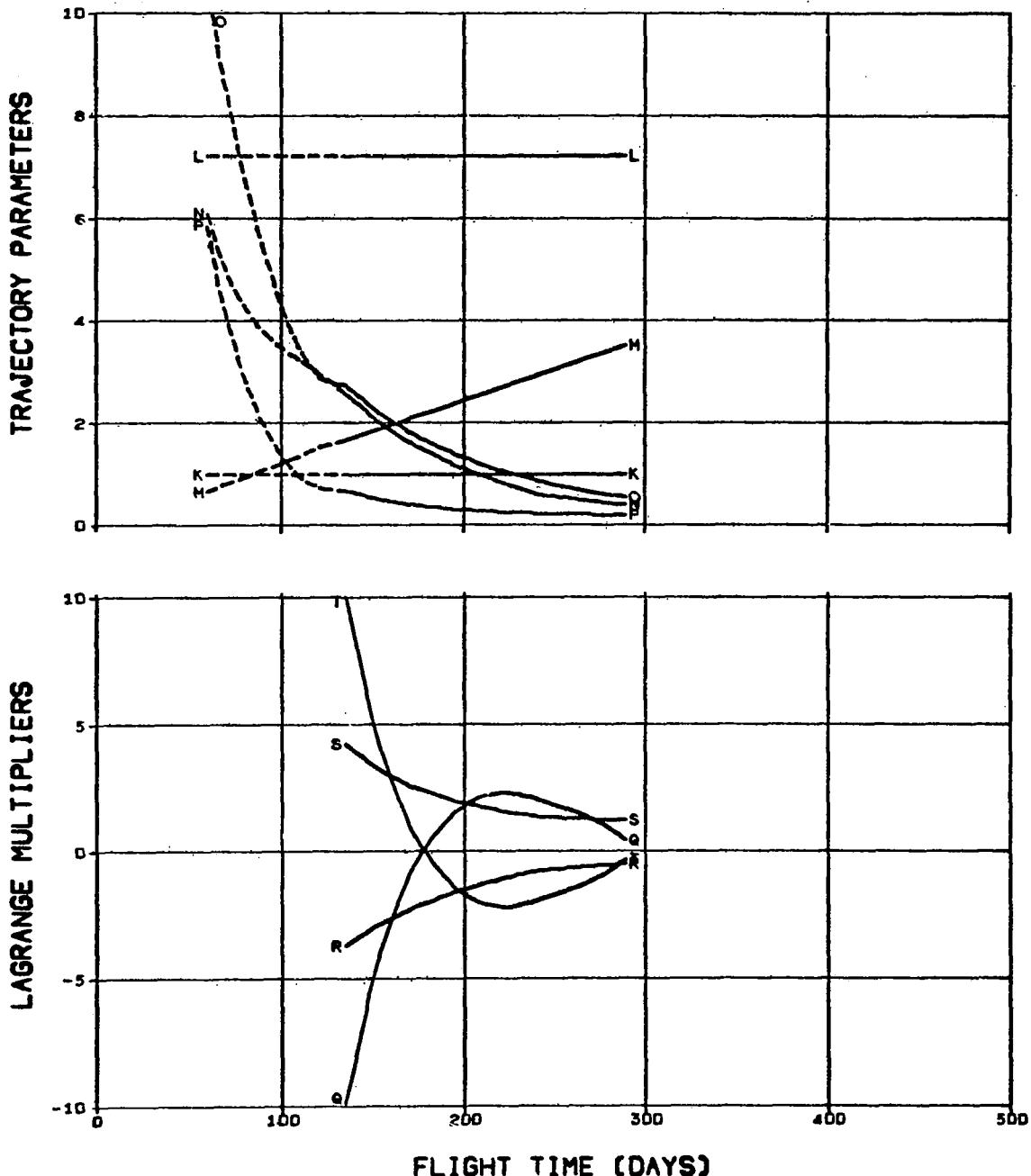
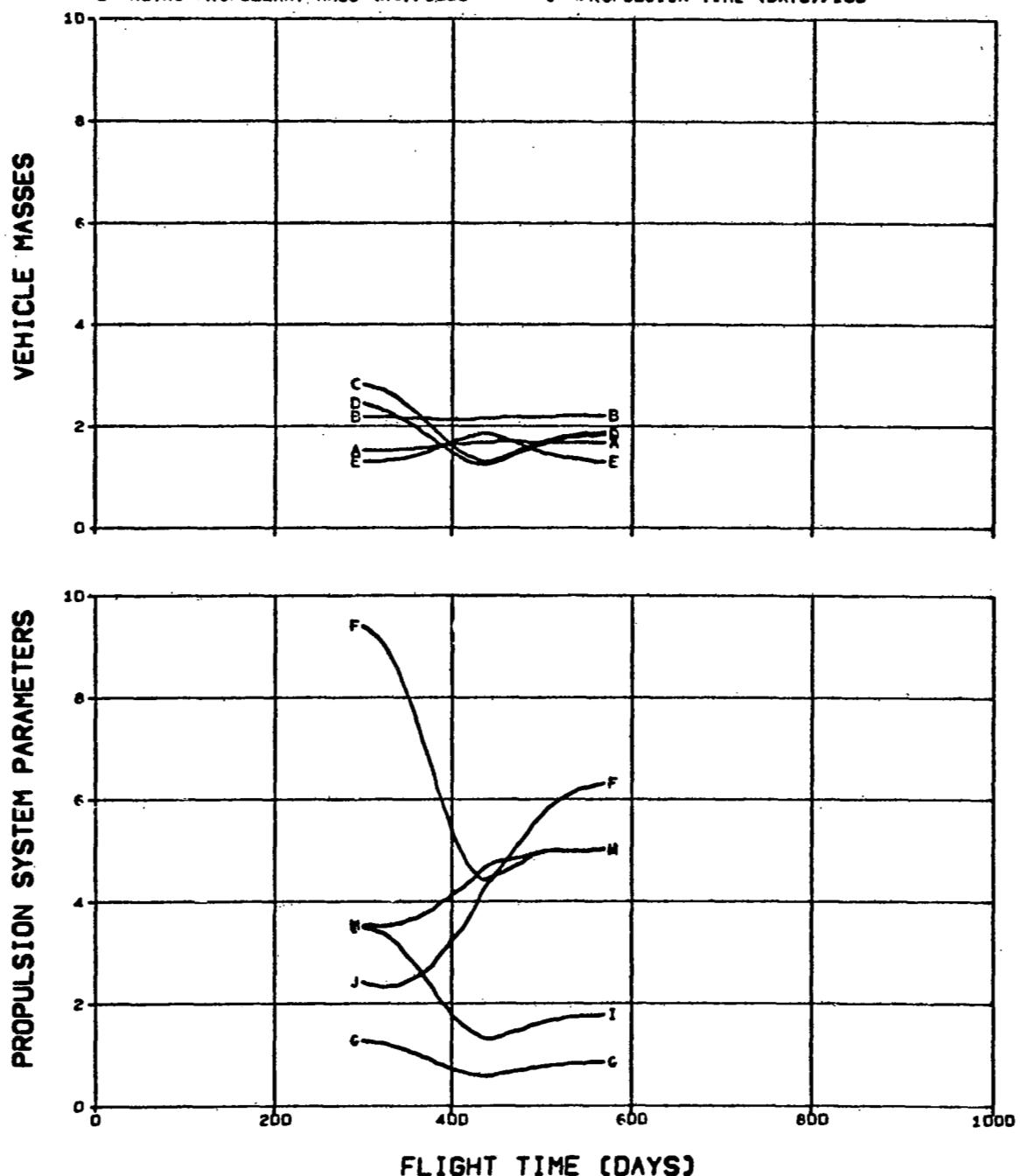


FIG. 2.3.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/100



**FIG. 2.5.1 VENUS MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

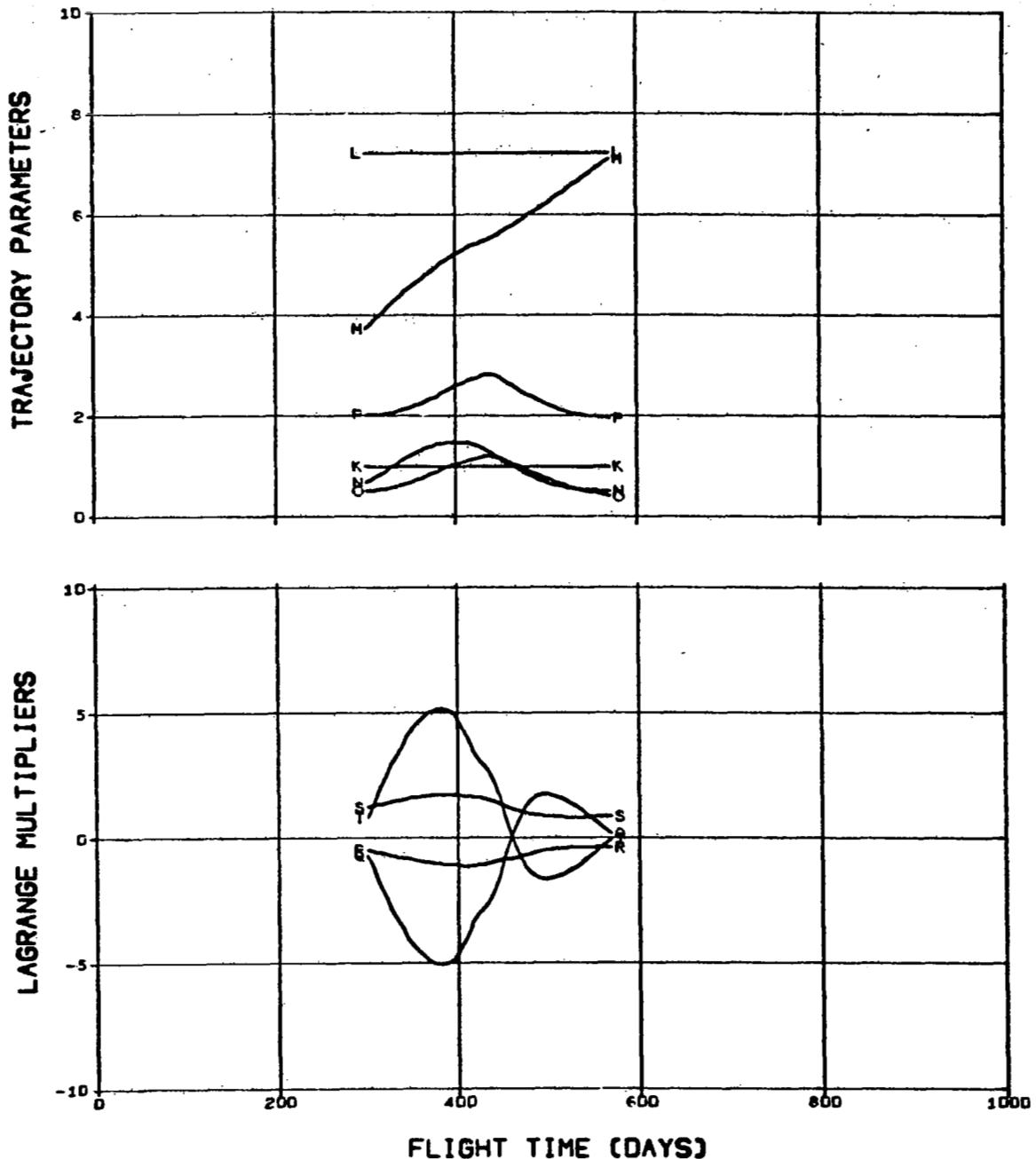
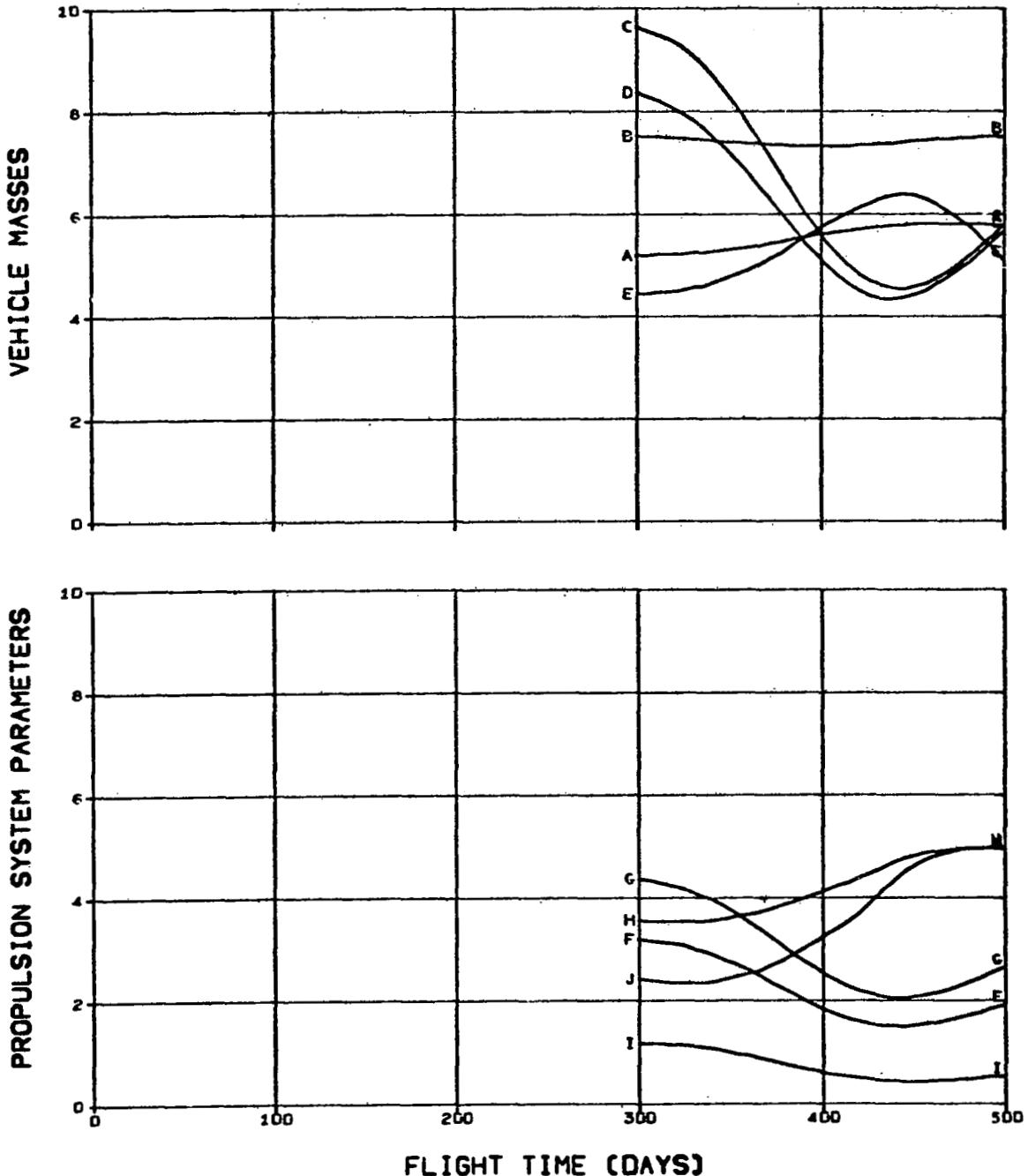


FIG. 2.5.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 2.5.2 VENUS MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

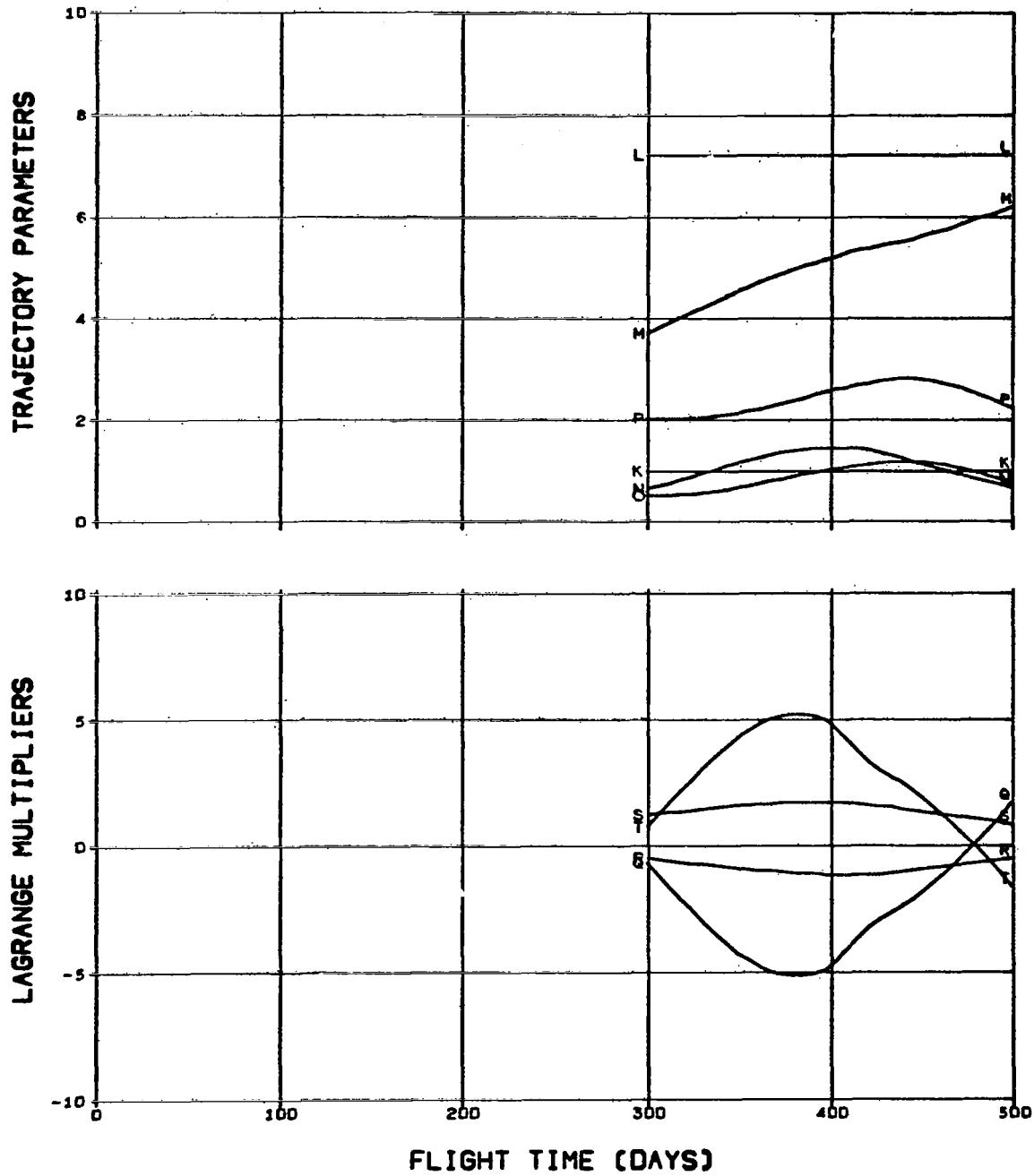
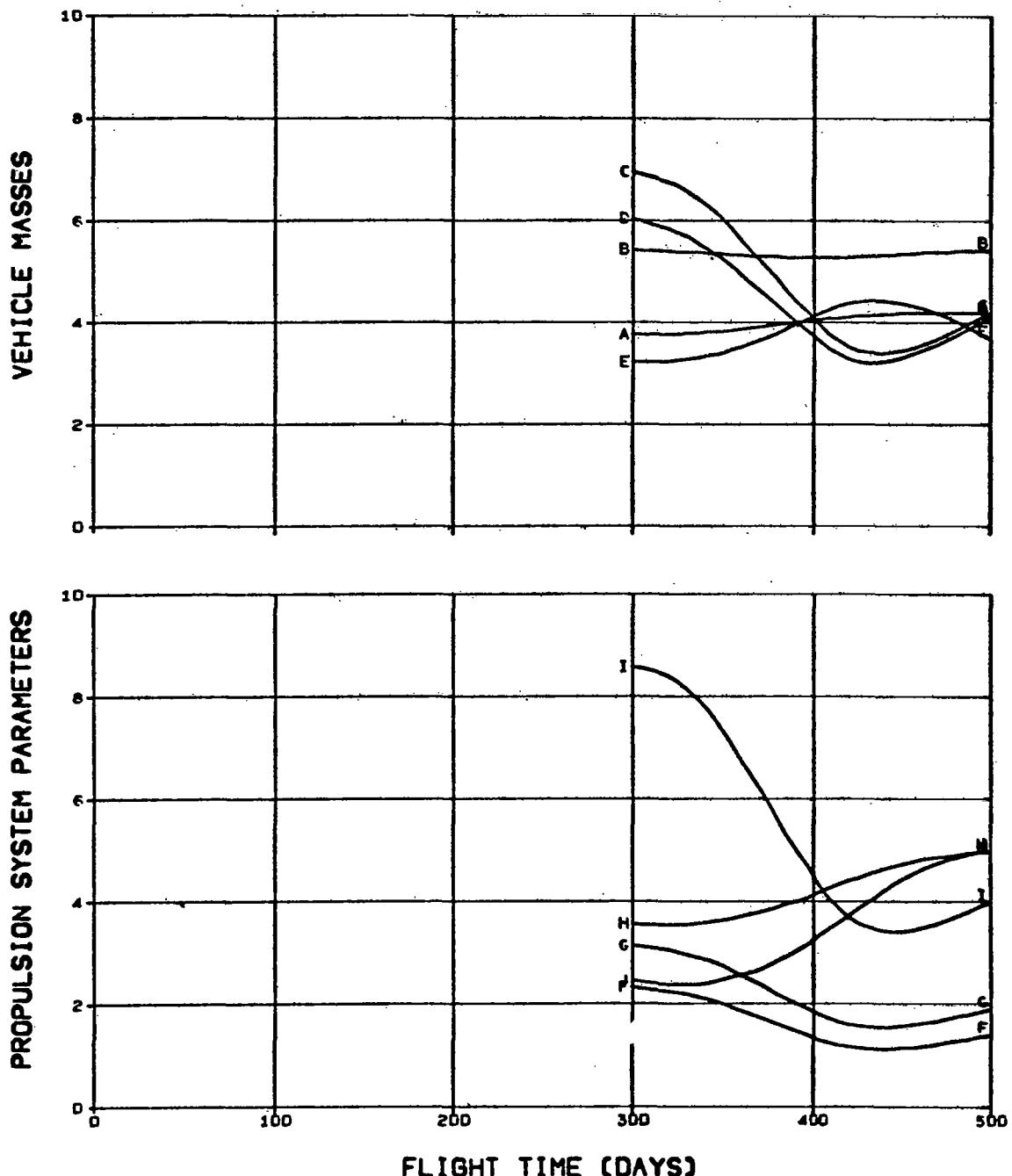


FIG. 2.5.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLSION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/100



**FIG. 2.5.3 VENUS MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/100
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

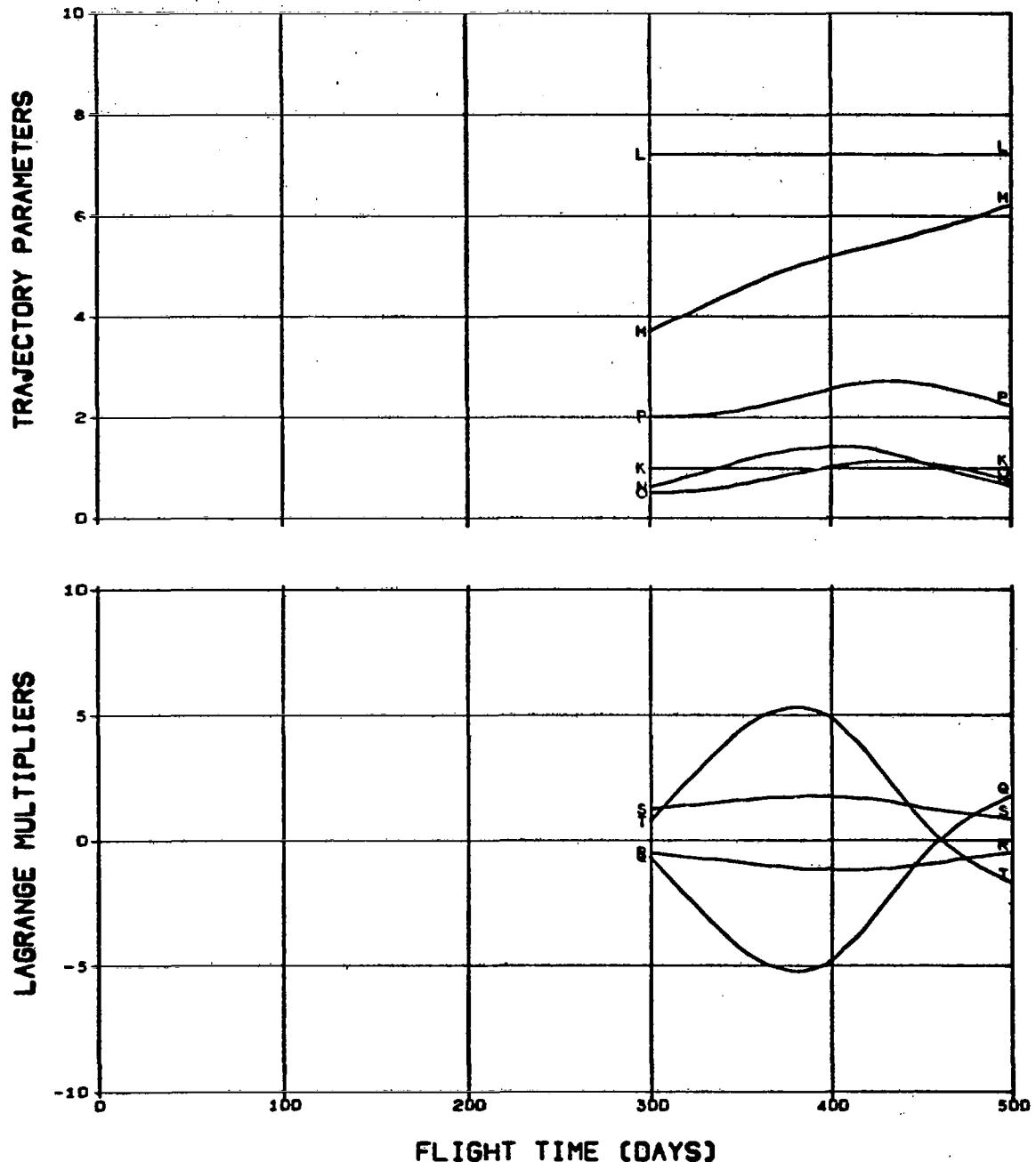
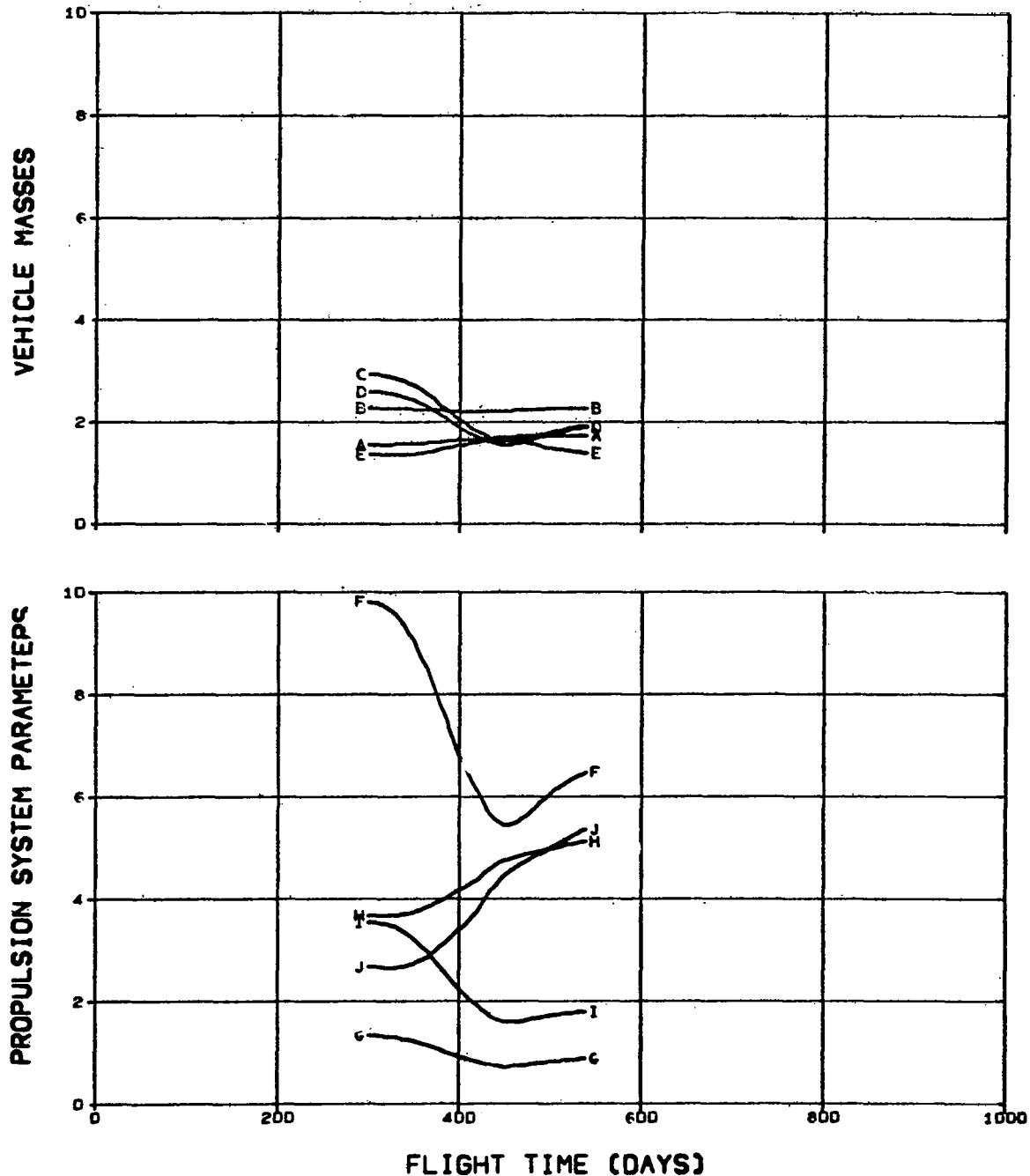


FIG. 2.5.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO. PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 2.5.4 VENUS MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEC)/100
 N LAUNCH EXCESS SPEED (M/SEC)/100
 O ARRIVAL EXCESS SPEED (M/SEC)/100
 P RETRO INCREMENTAL SPEED (M/SEC)/100
 Q X-COMPONENT OF PRIMER/1.00E-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

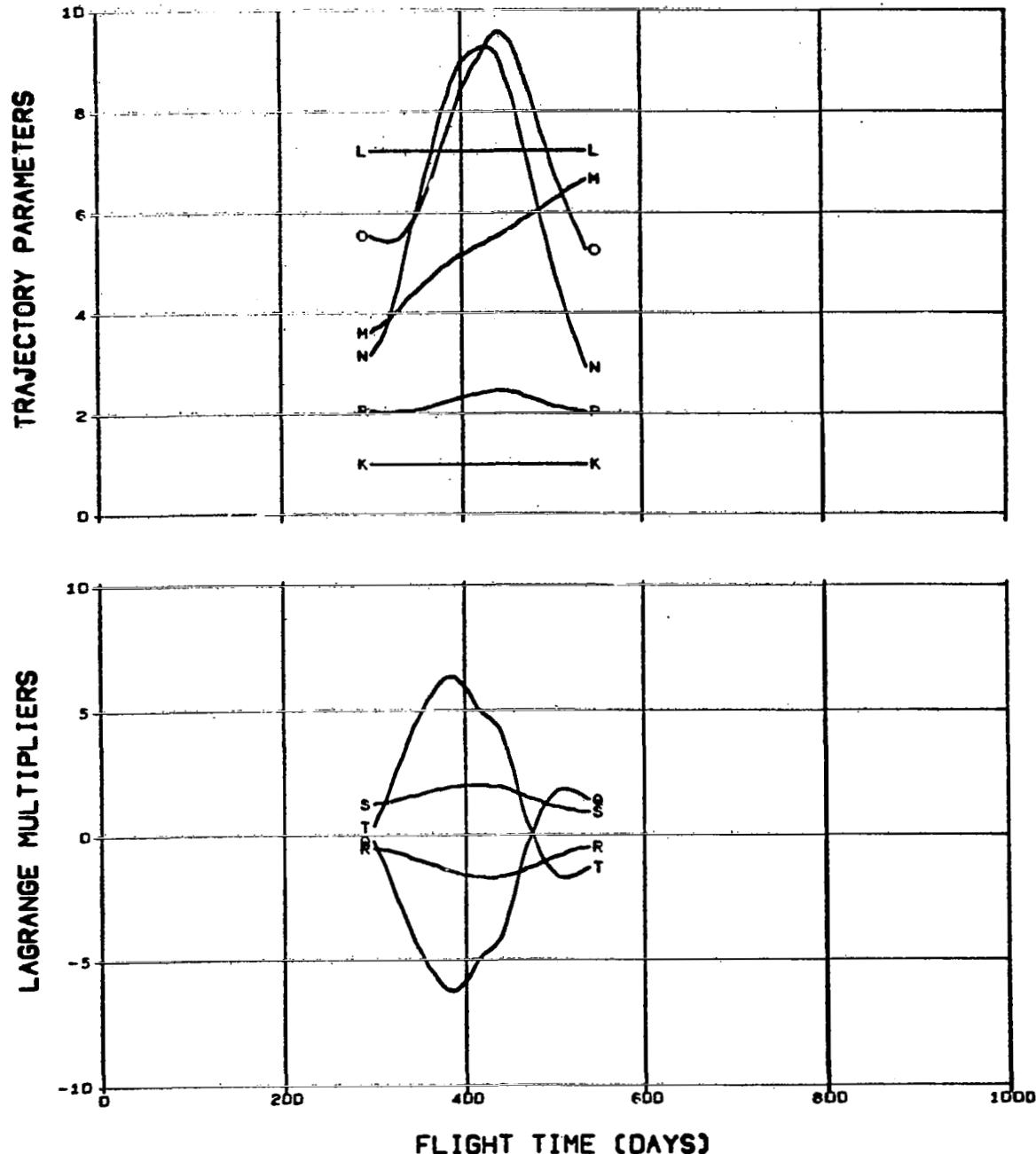
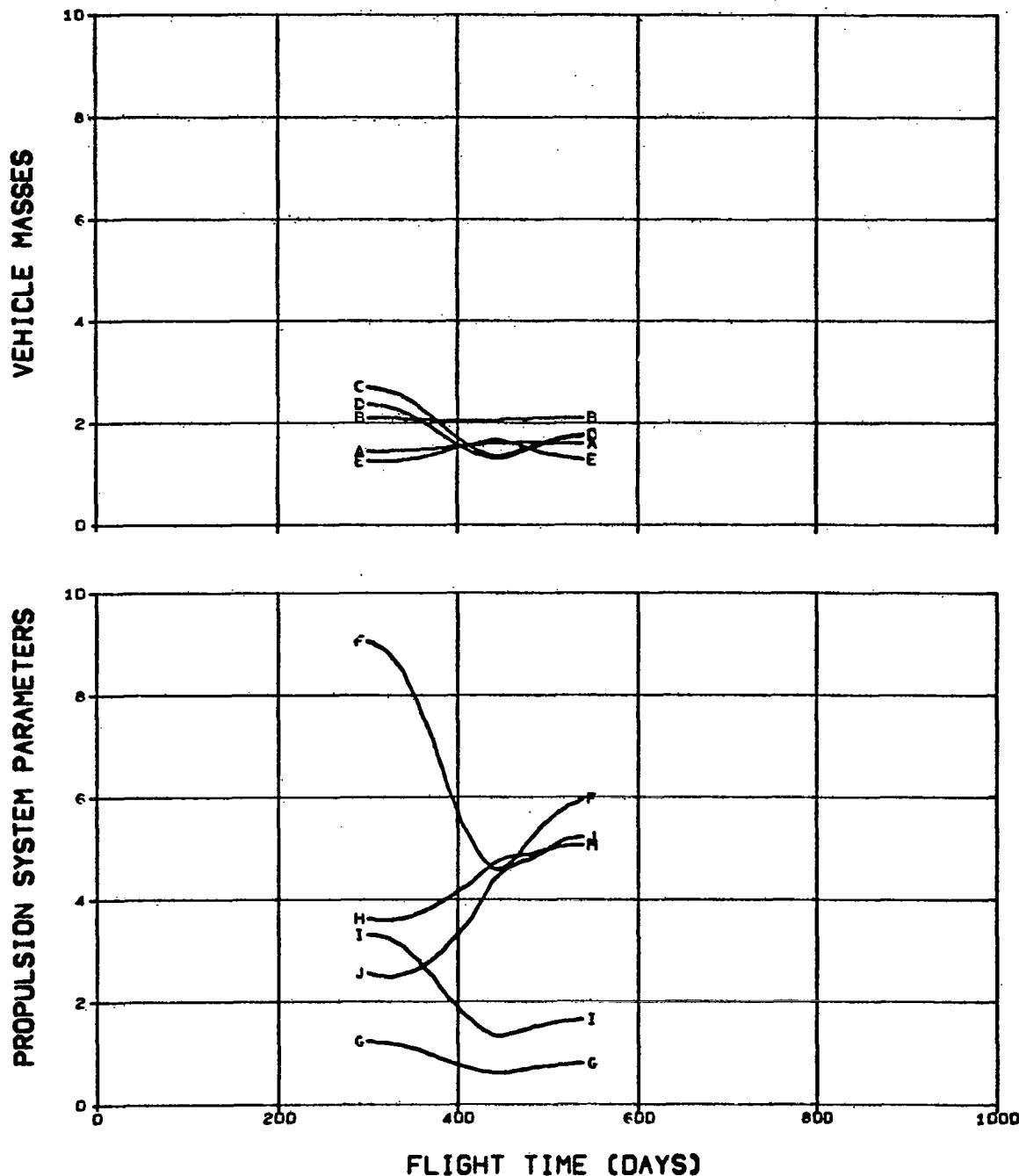


FIG. 2.5.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 2.5.5 VENUS MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

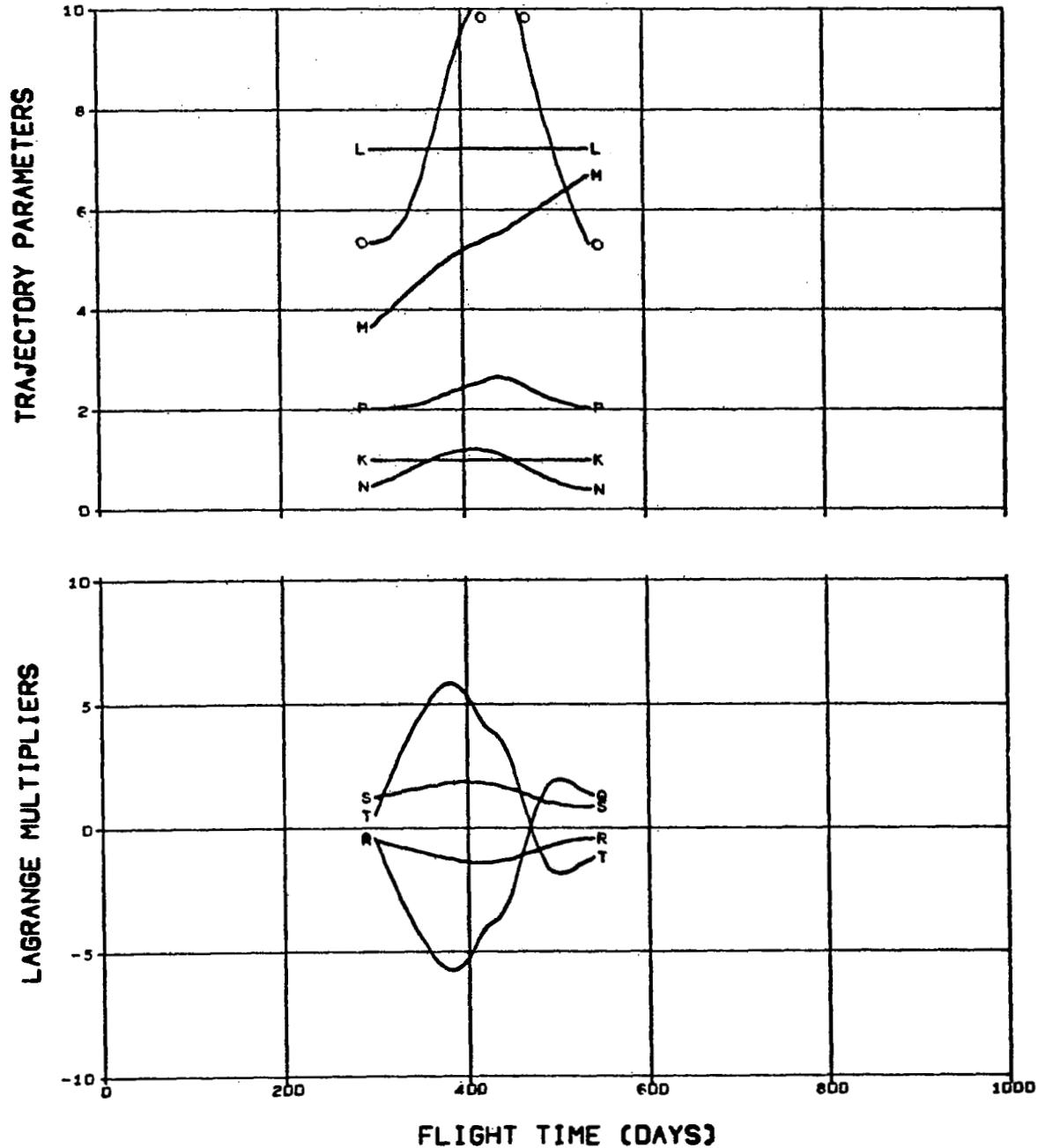
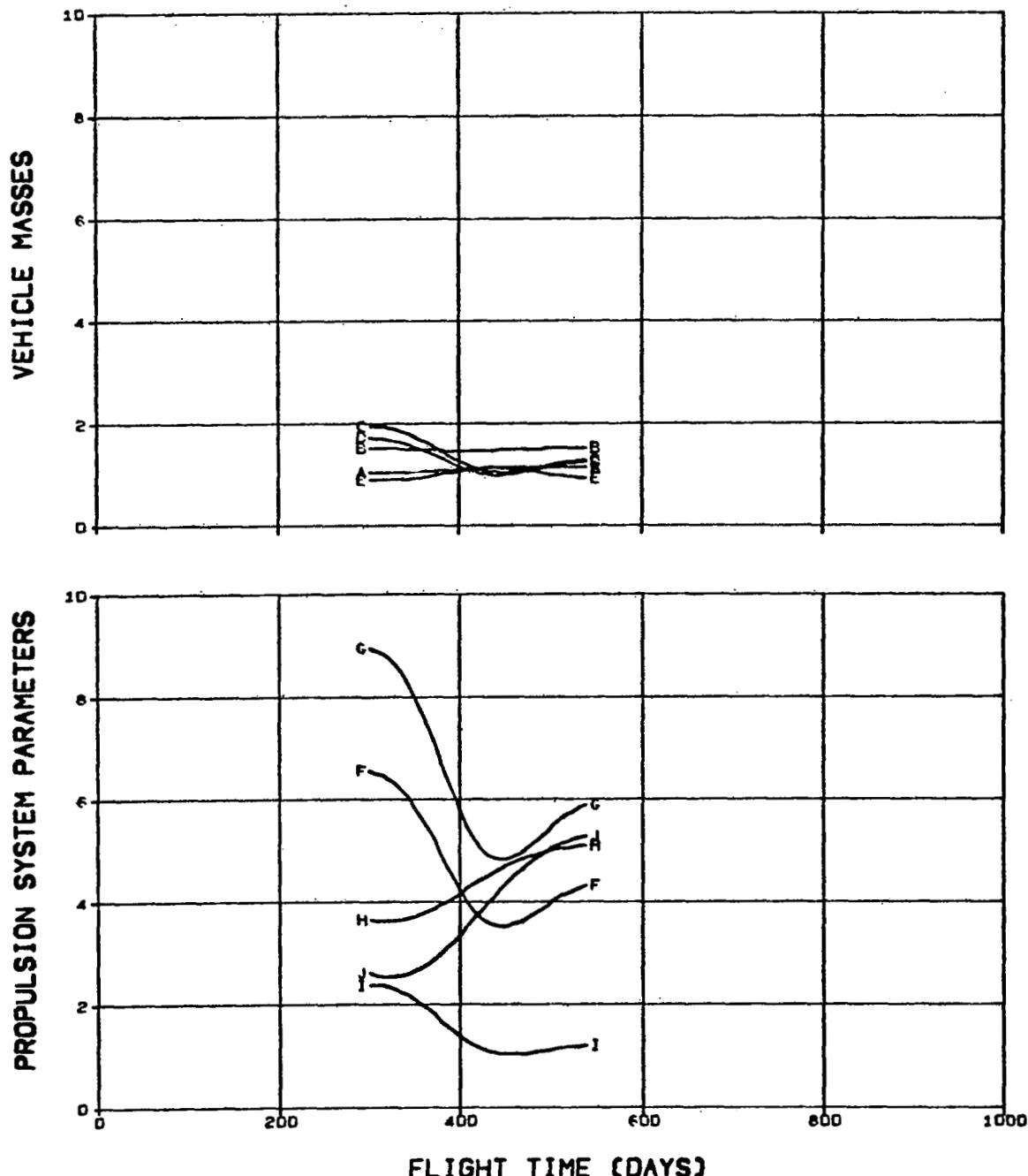


FIG. 2.5.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.0DE-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/100



**FIG. 2.5.6 VENUS MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLANT SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/100
 P RETRO INCREMENTAL SPEED (M/SEC)/100
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

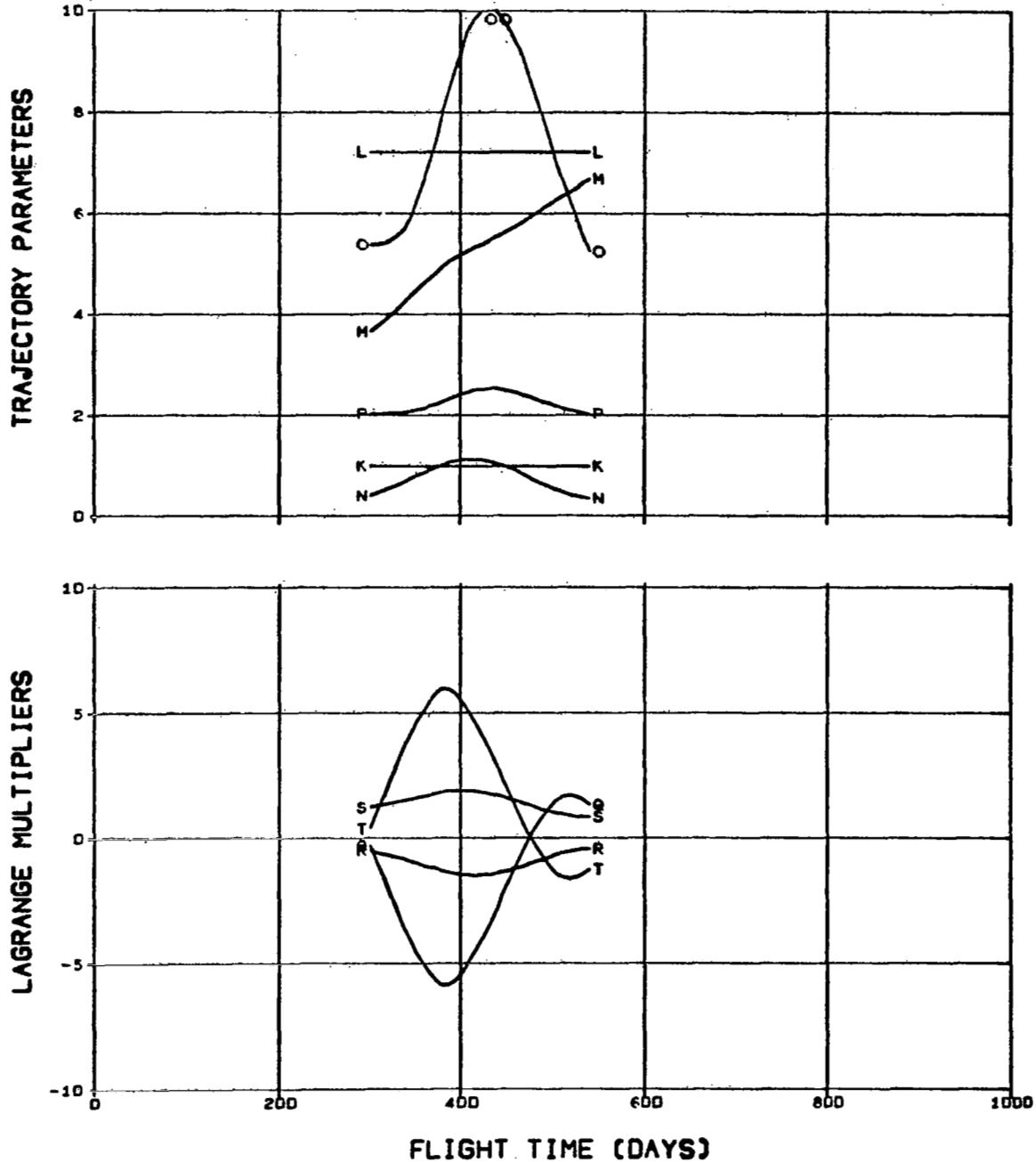


FIG. 2.5.6 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/10000
 B INITIAL SPACECRAFT MASS (KG)/10000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 E POWER AT 1 AU (KW)/10
 F MAXIMUM POWER (KW)/10
 G JET EXHAUST SPEED (M/SEC)/10000
 H THRUST AT 1 AU (N)
 I PROPULSION TIME (DAYS)/100

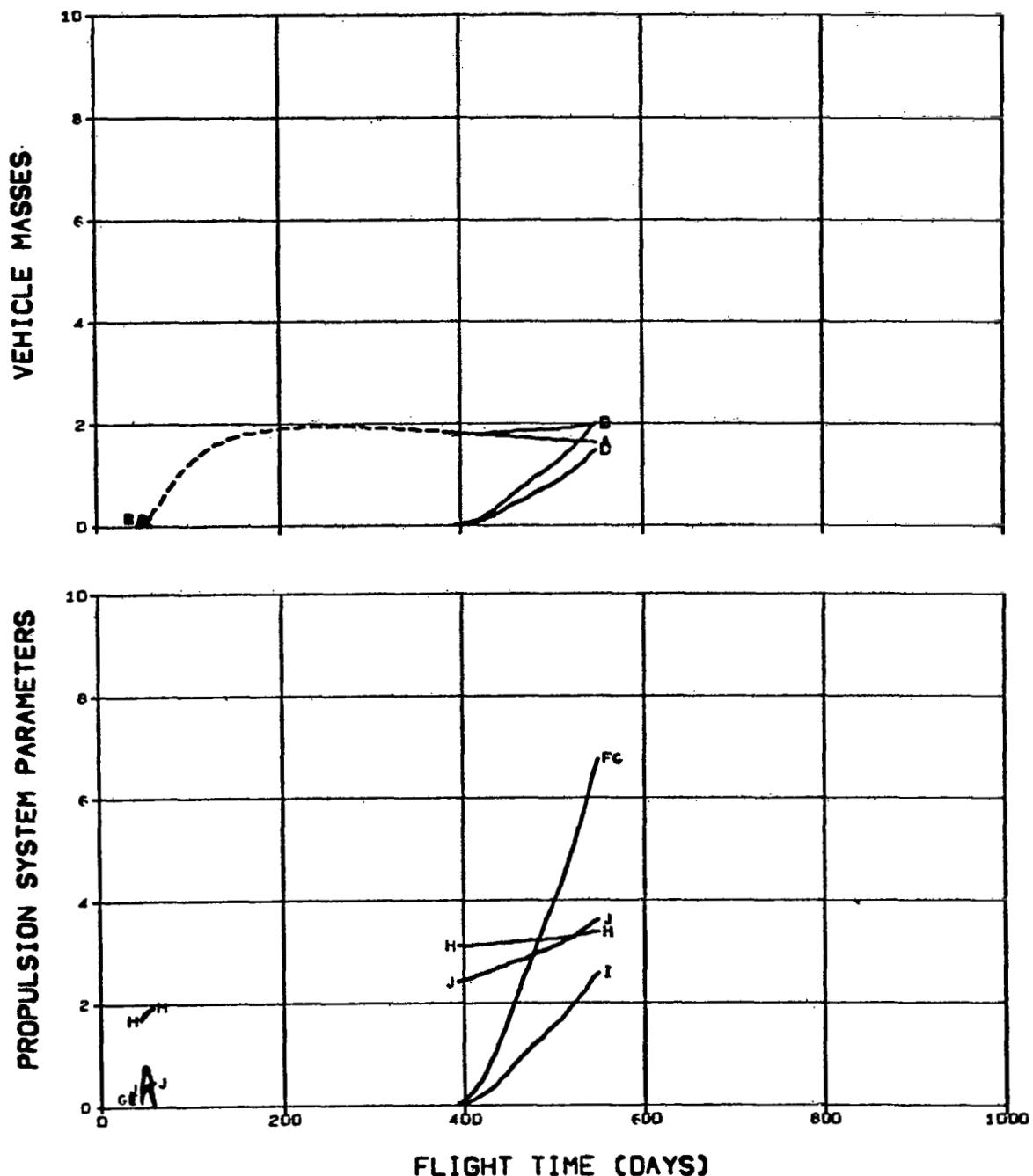


FIG. 3.1.1 MARS MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

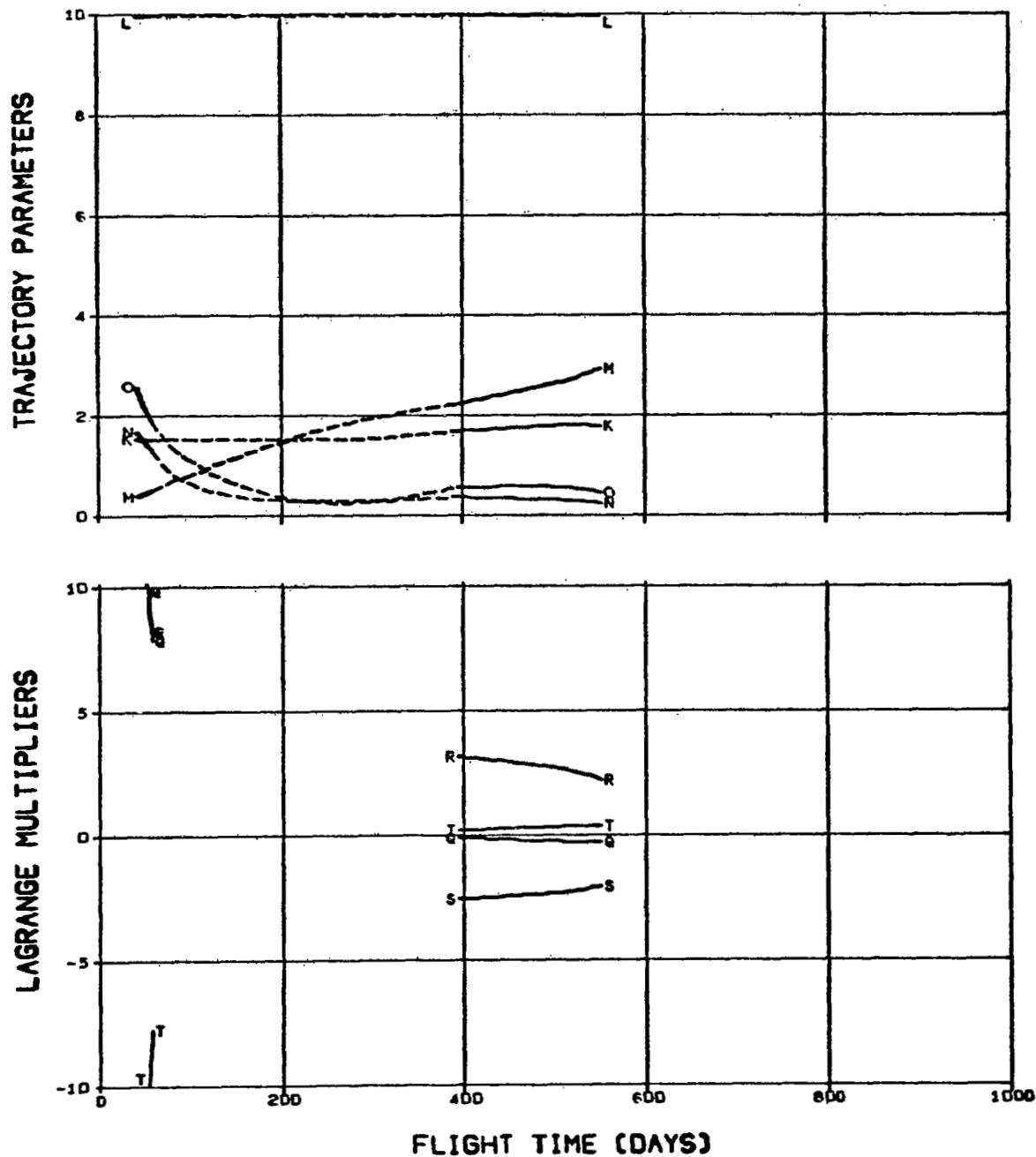


FIG. 3.1.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPULSION TIME (DAYS)/100

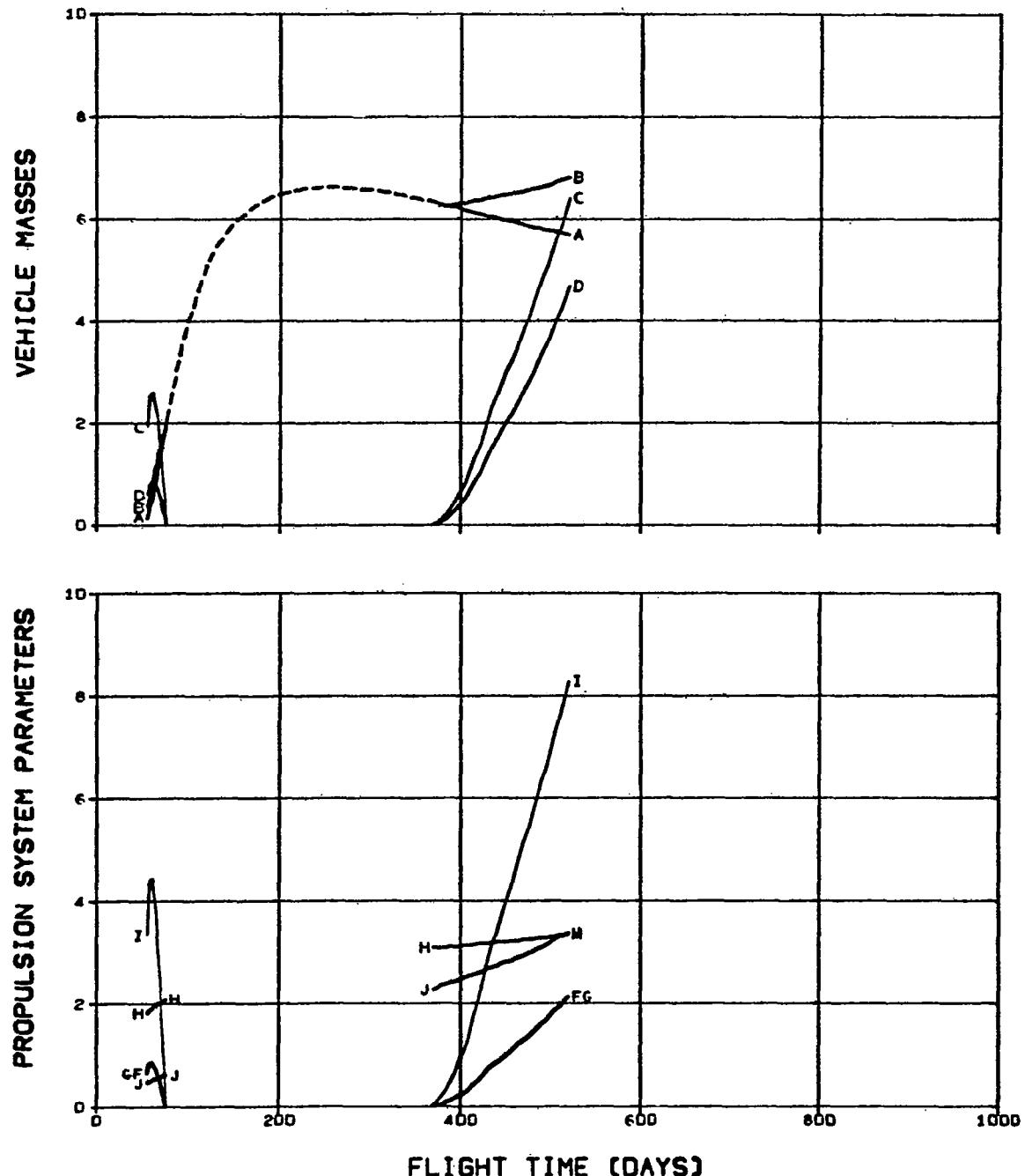


FIG. 3.1.2 MARS MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

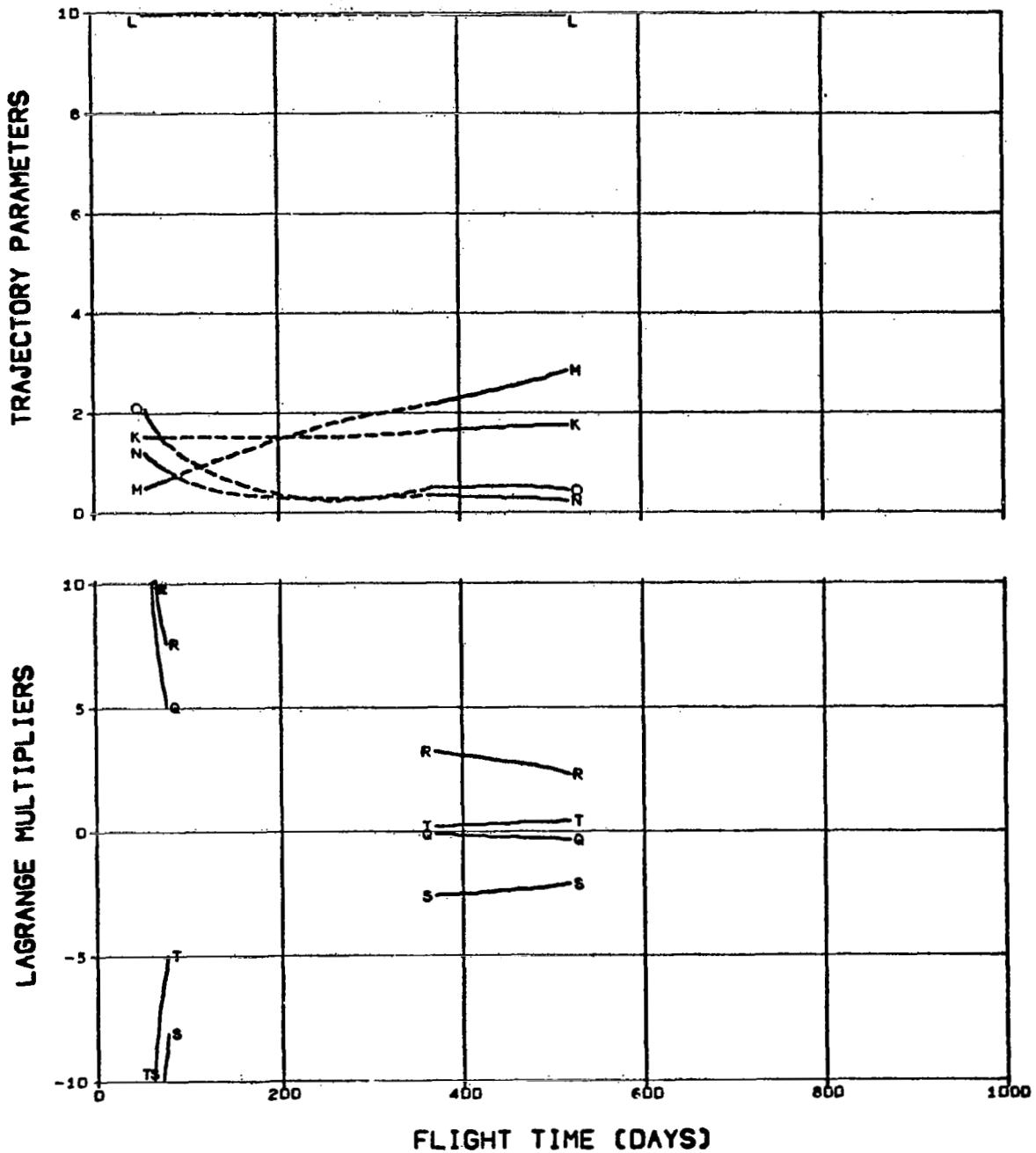


FIG. 3.1.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPULSION TIME (DAYS)/100

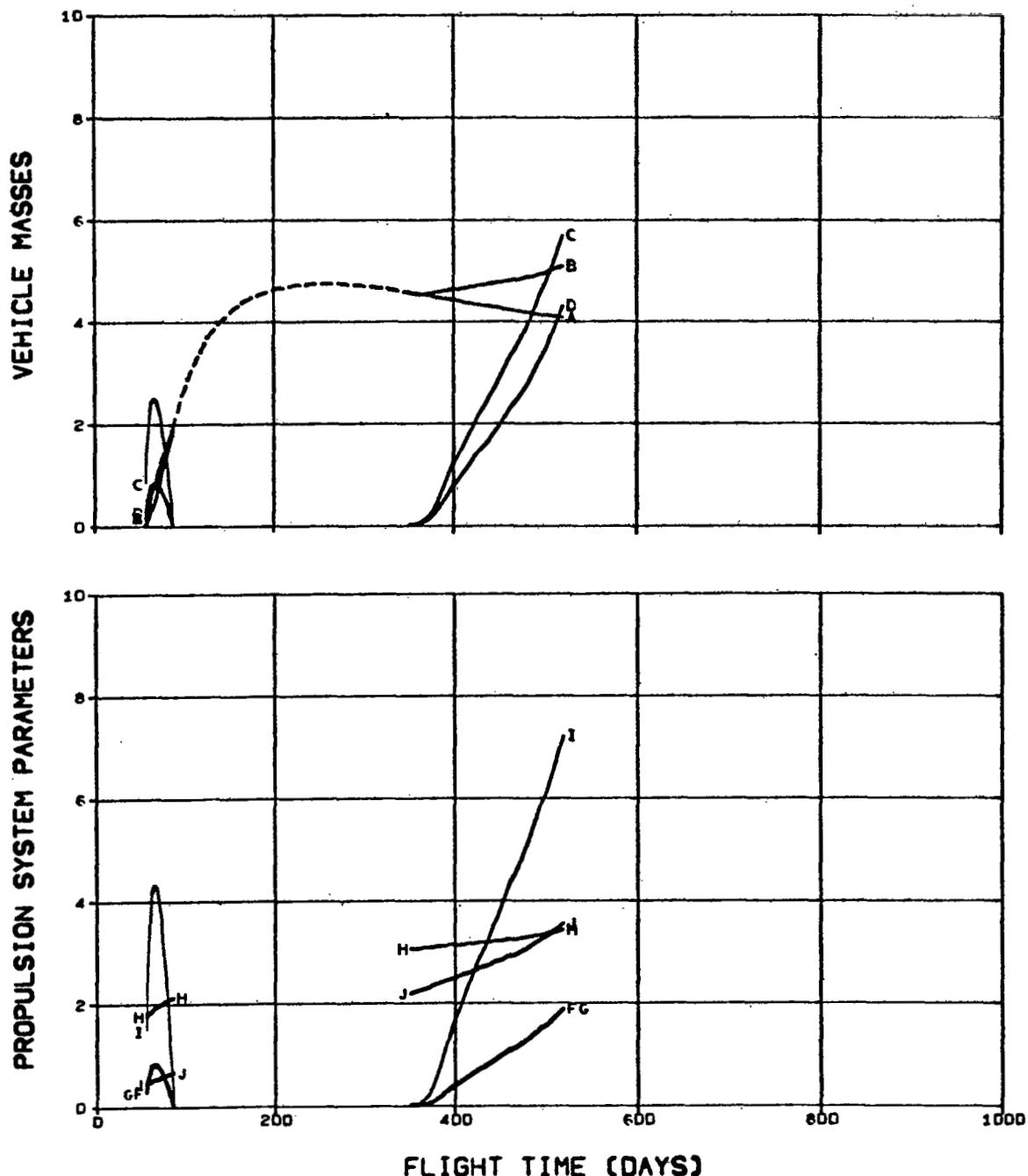


FIG. 3.1.3 MARS MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

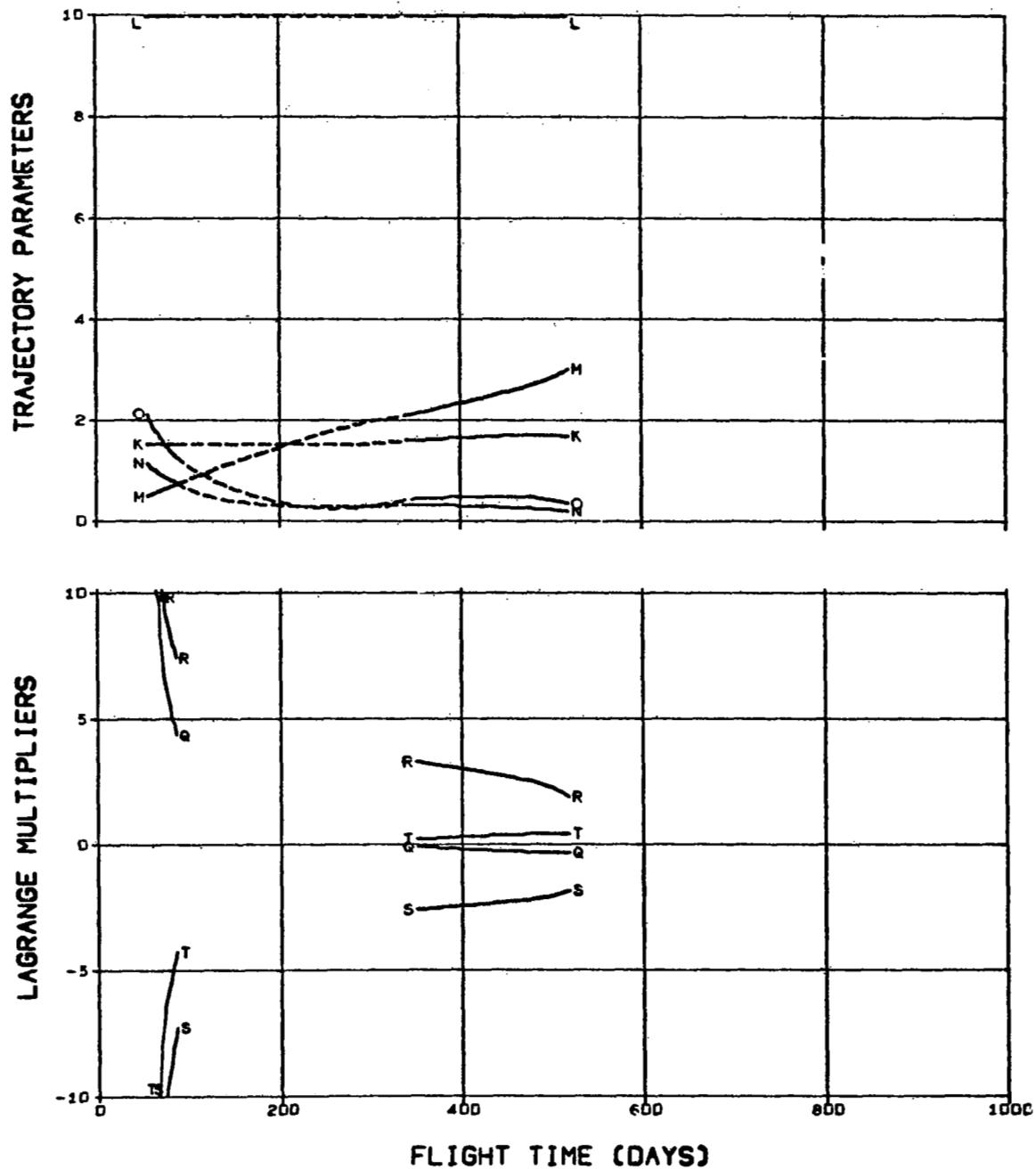


FIG. 3.1.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/100

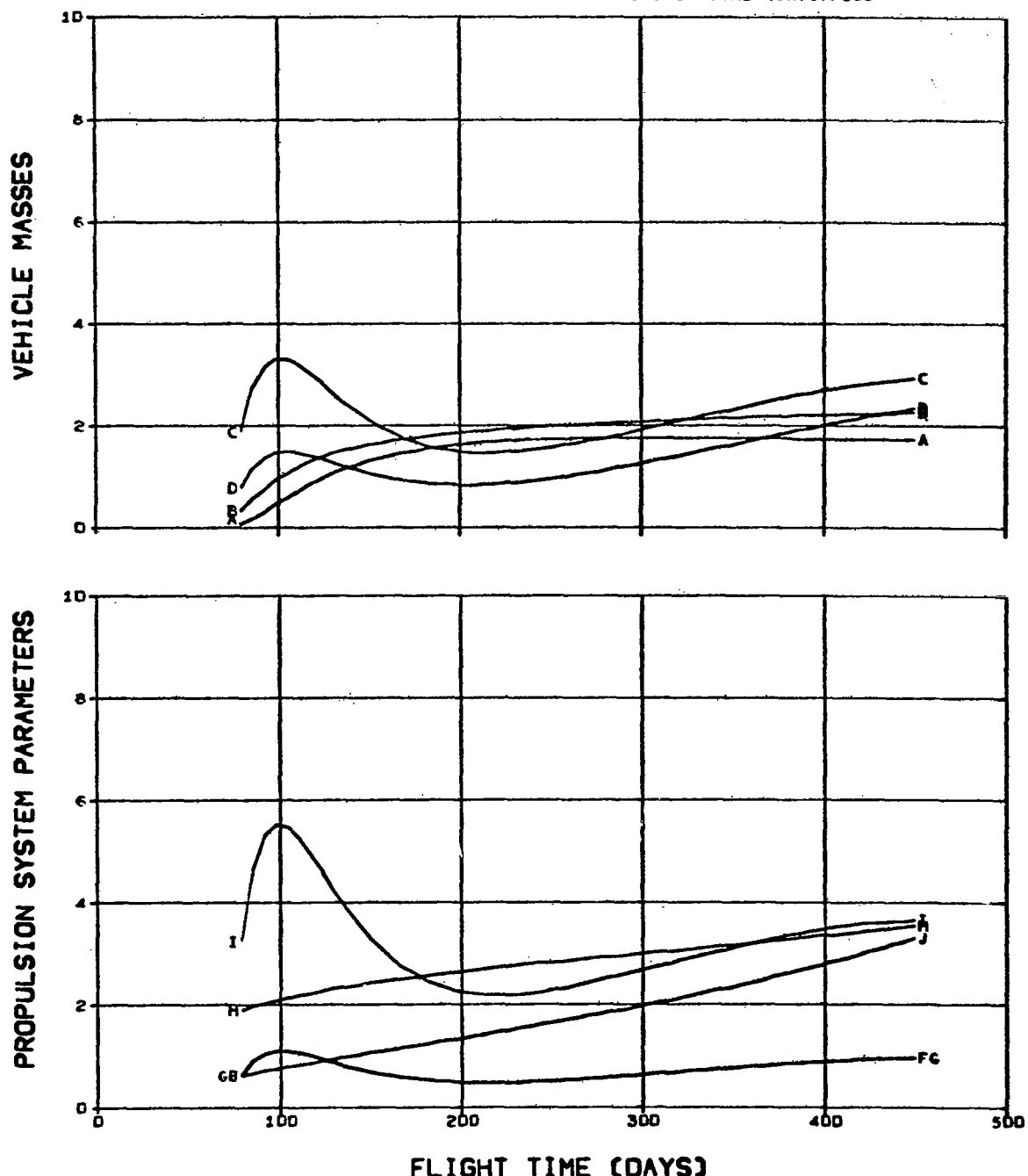


FIG. 3.1.4 MARS MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

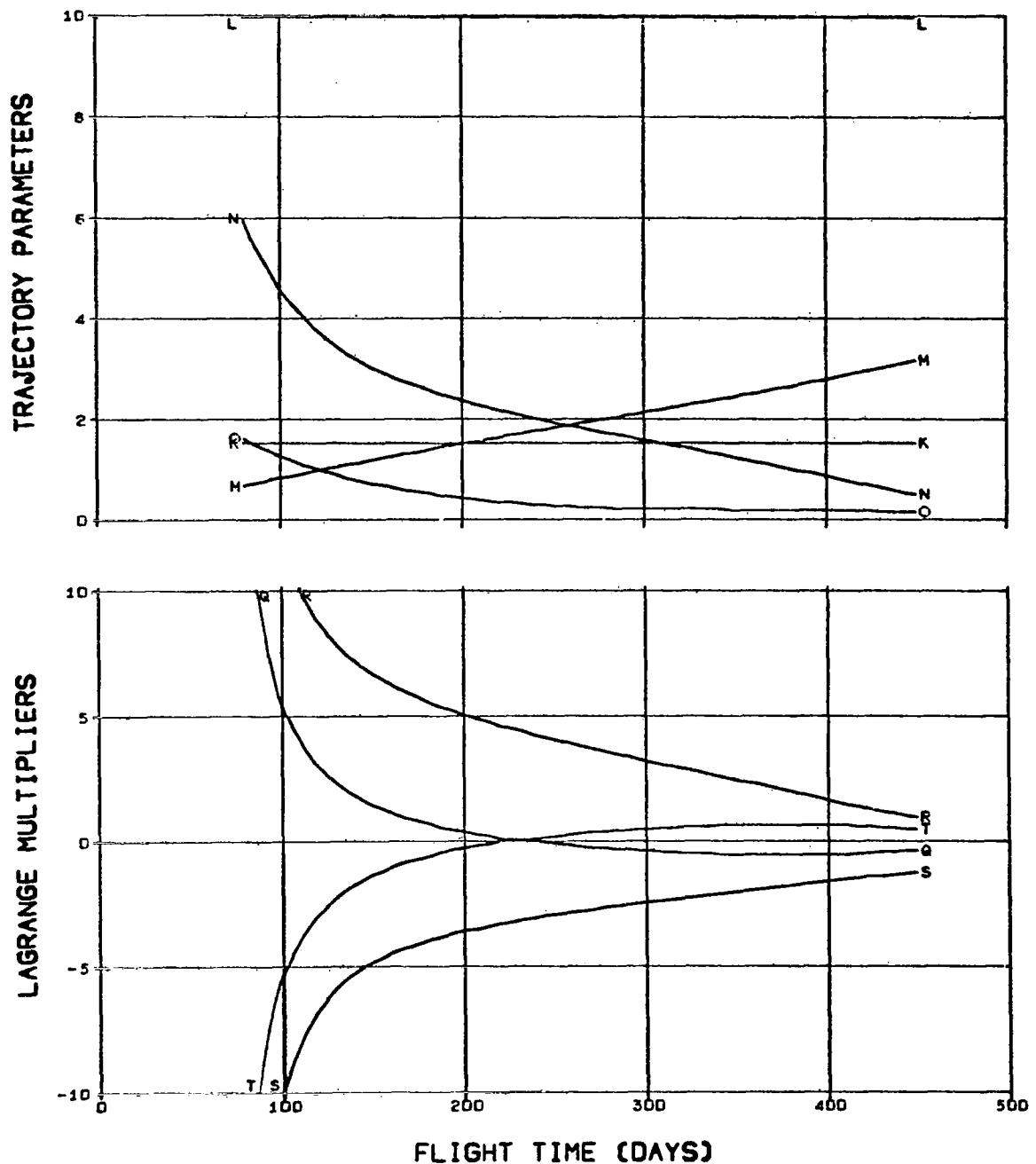


FIG. 3.1.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLION TIME (DAYS)/100

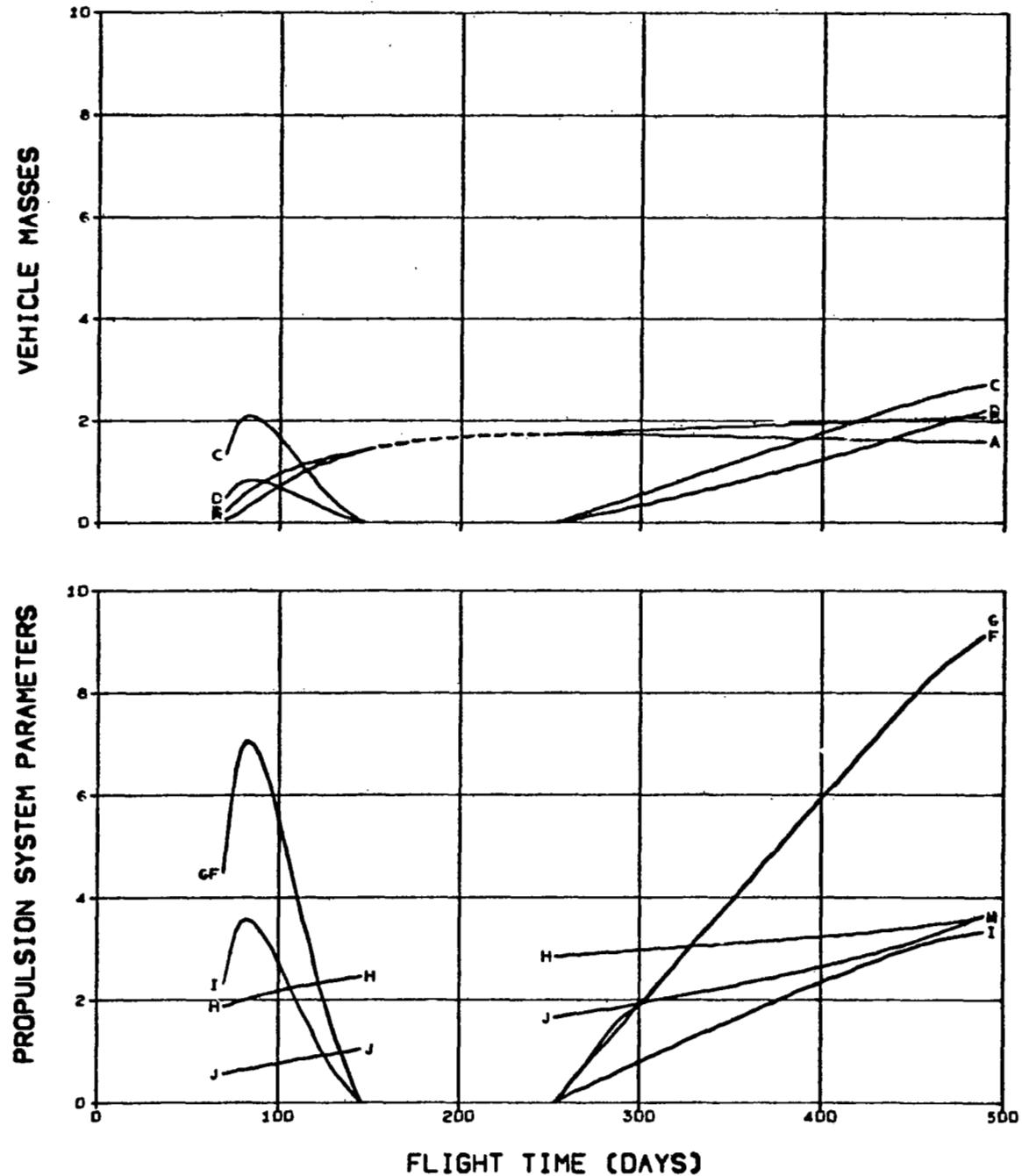


FIG. 3.1.5 MARS MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

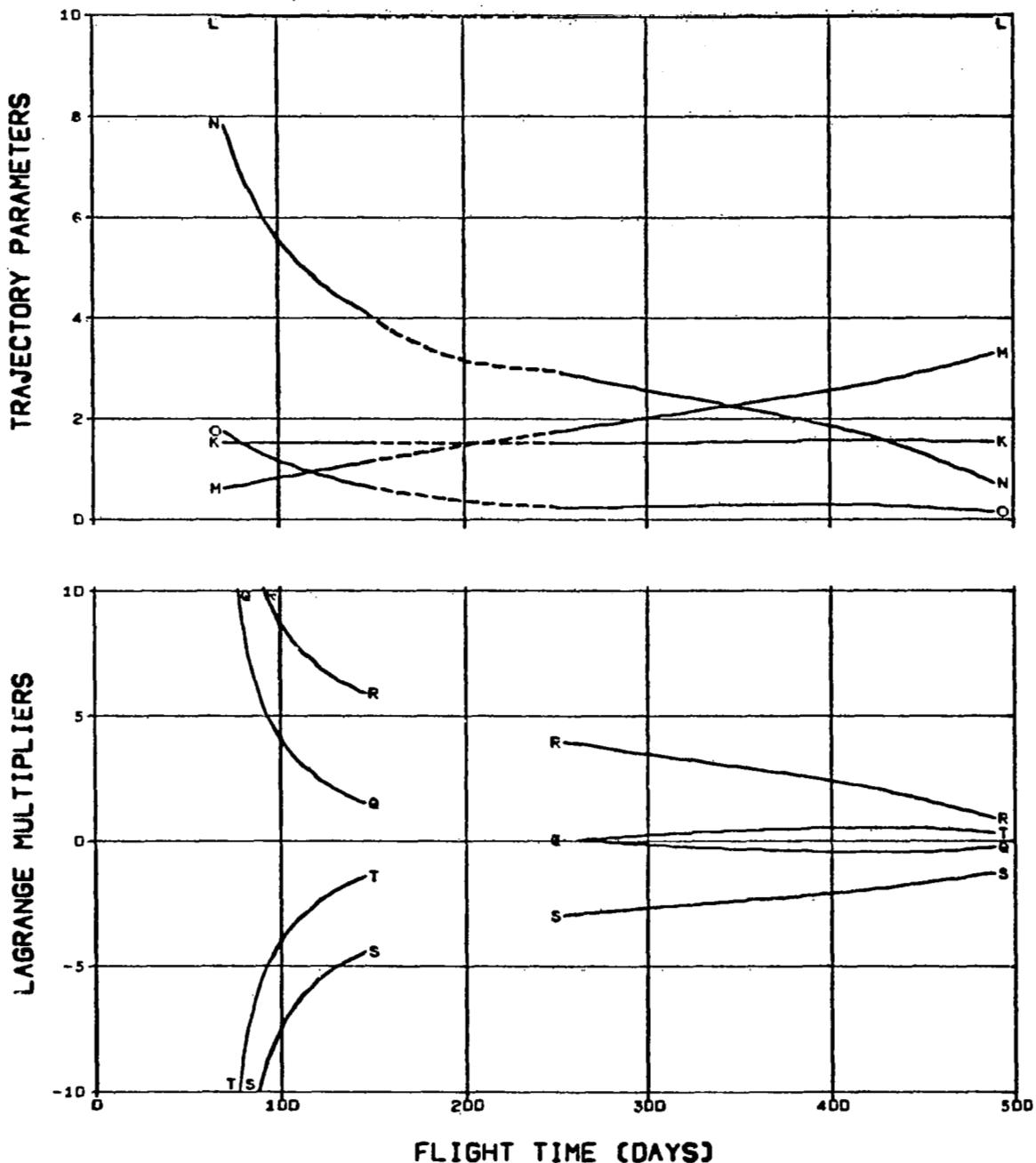
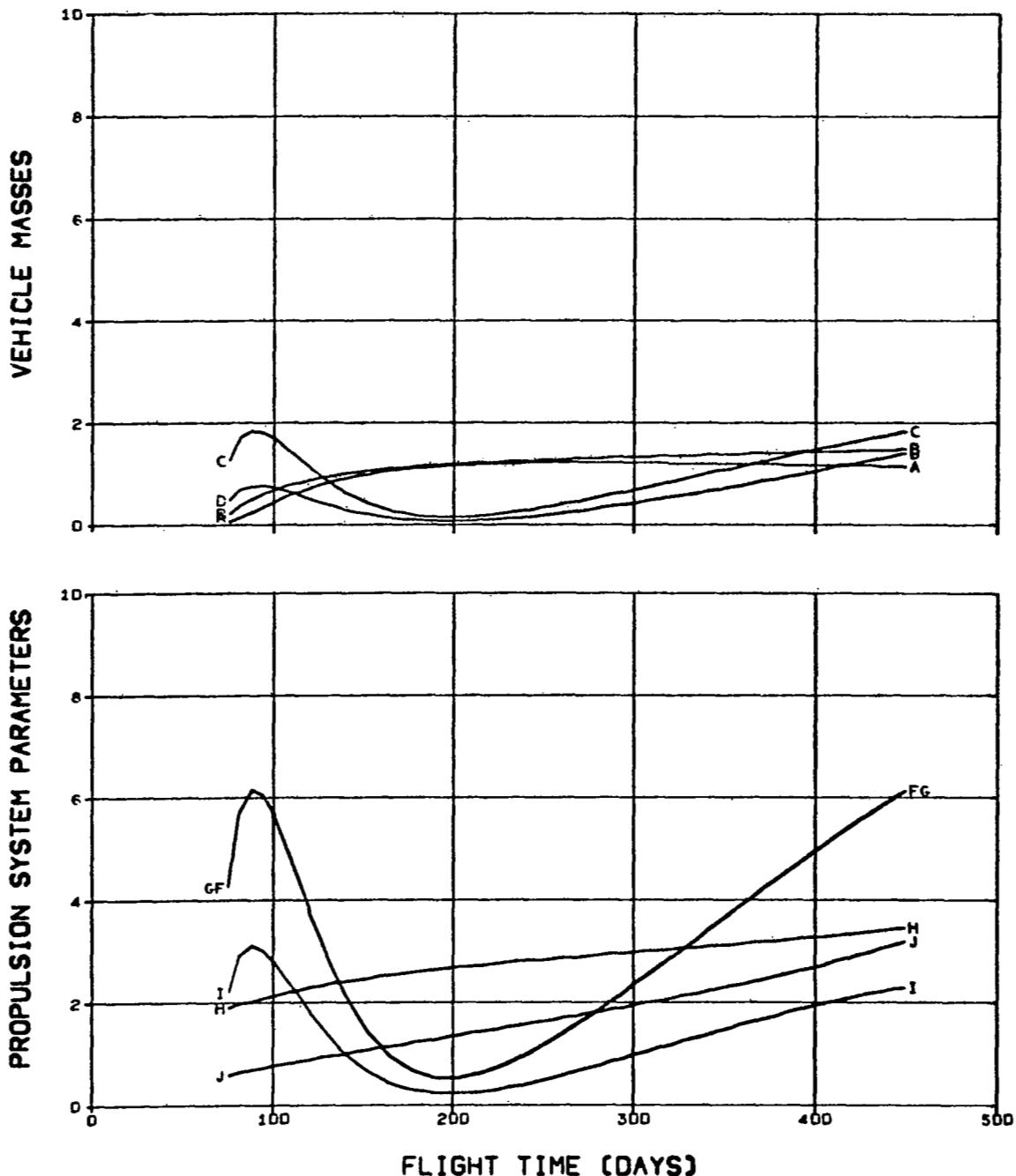


FIG. 3.1.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.DDE-1
		J	PROPELLUTION TIME (DAYS)/100



**FIG. 3.1.6 MARS MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

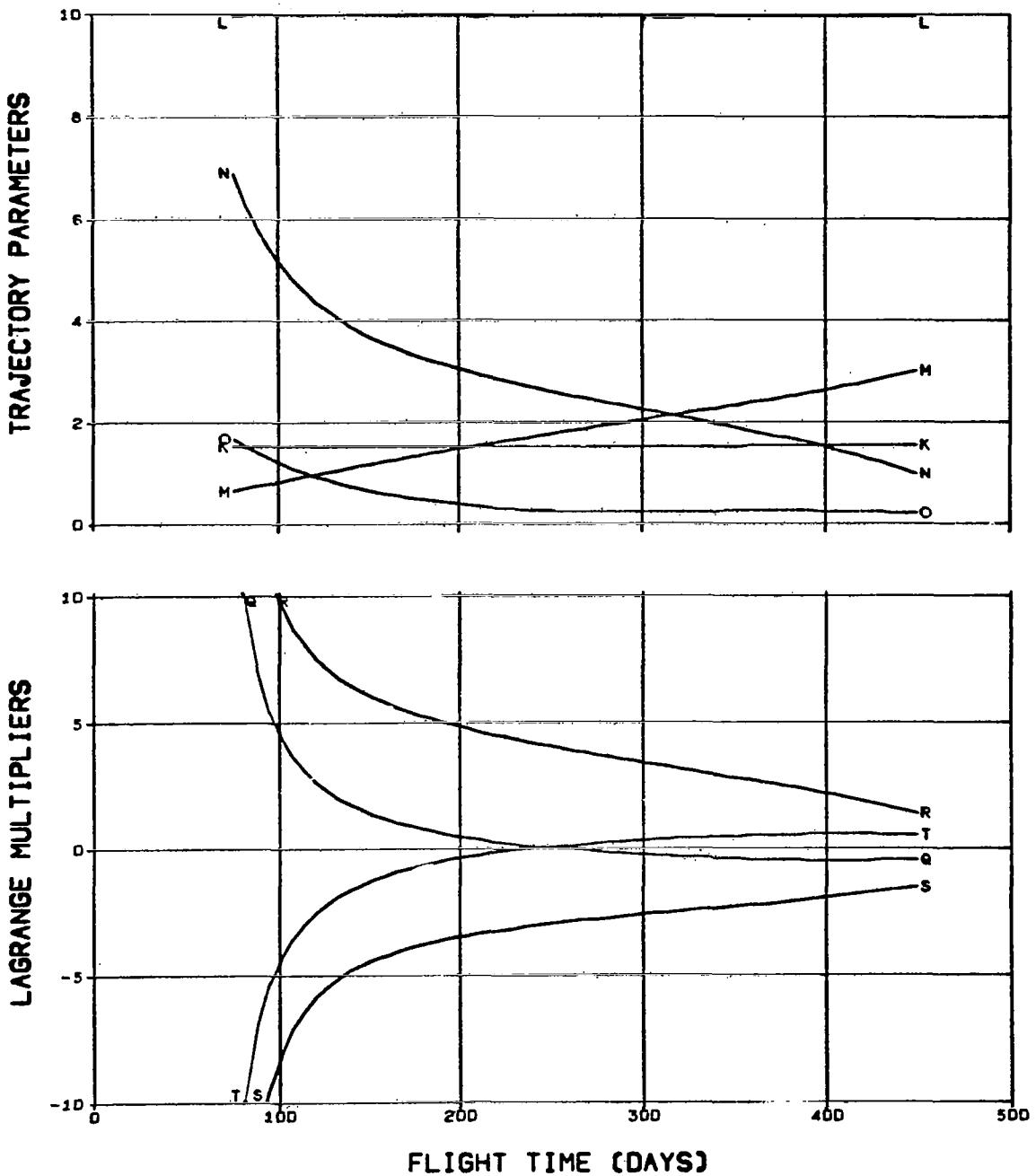


FIG. 3.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/100

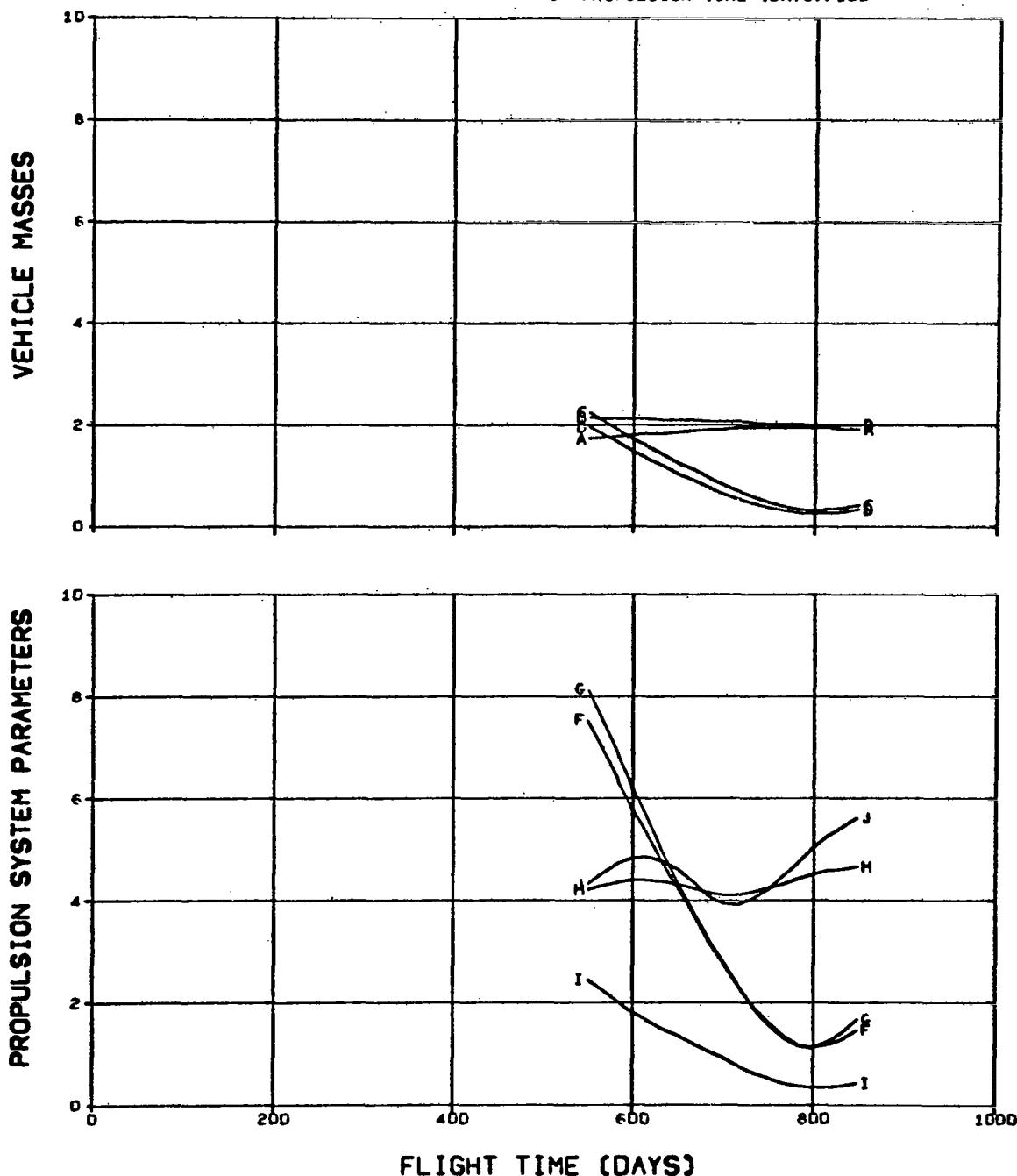


FIG. 3.2.1 MARS MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

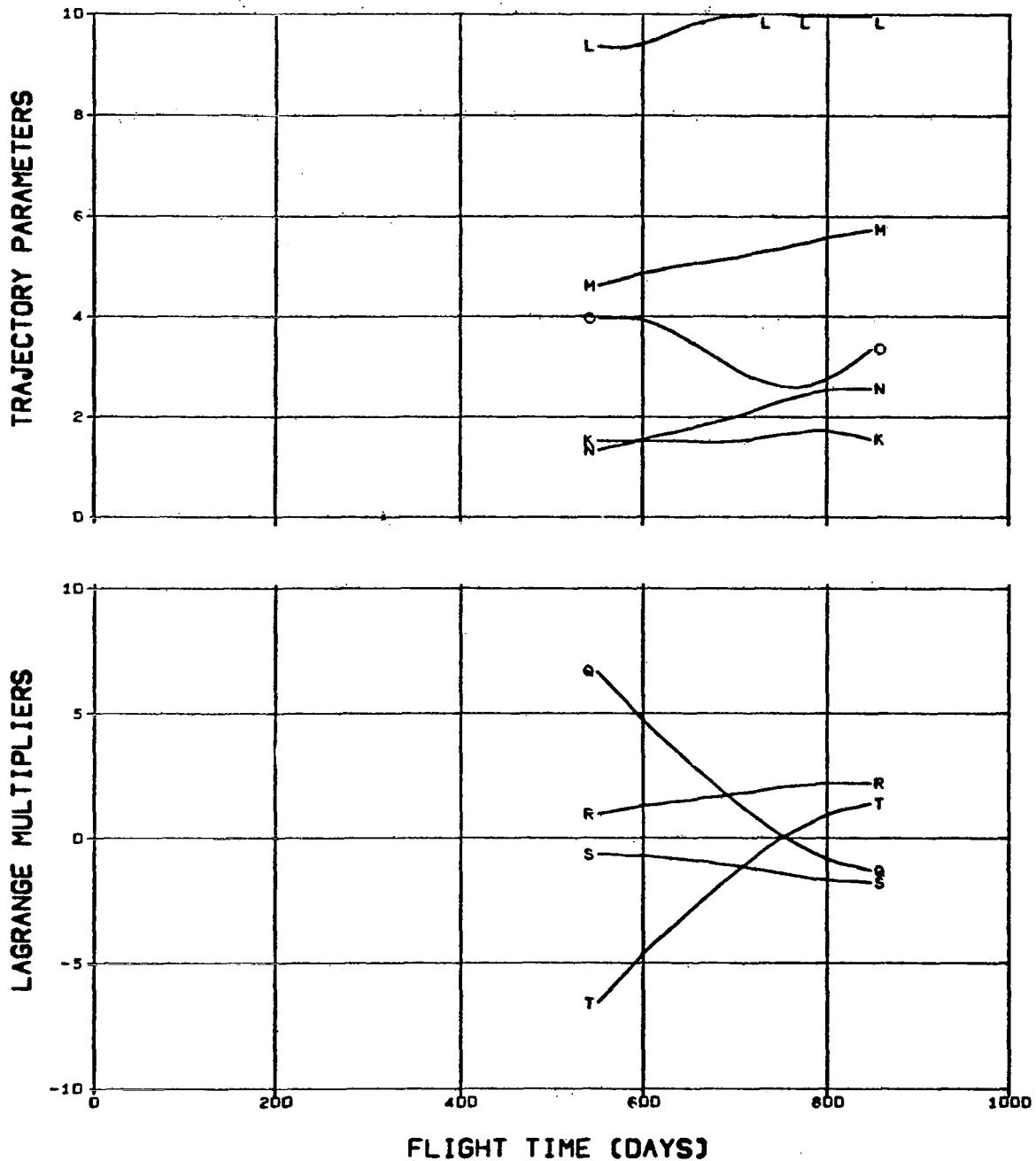


FIG. 3.2.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLION TIME (DAYS)/100

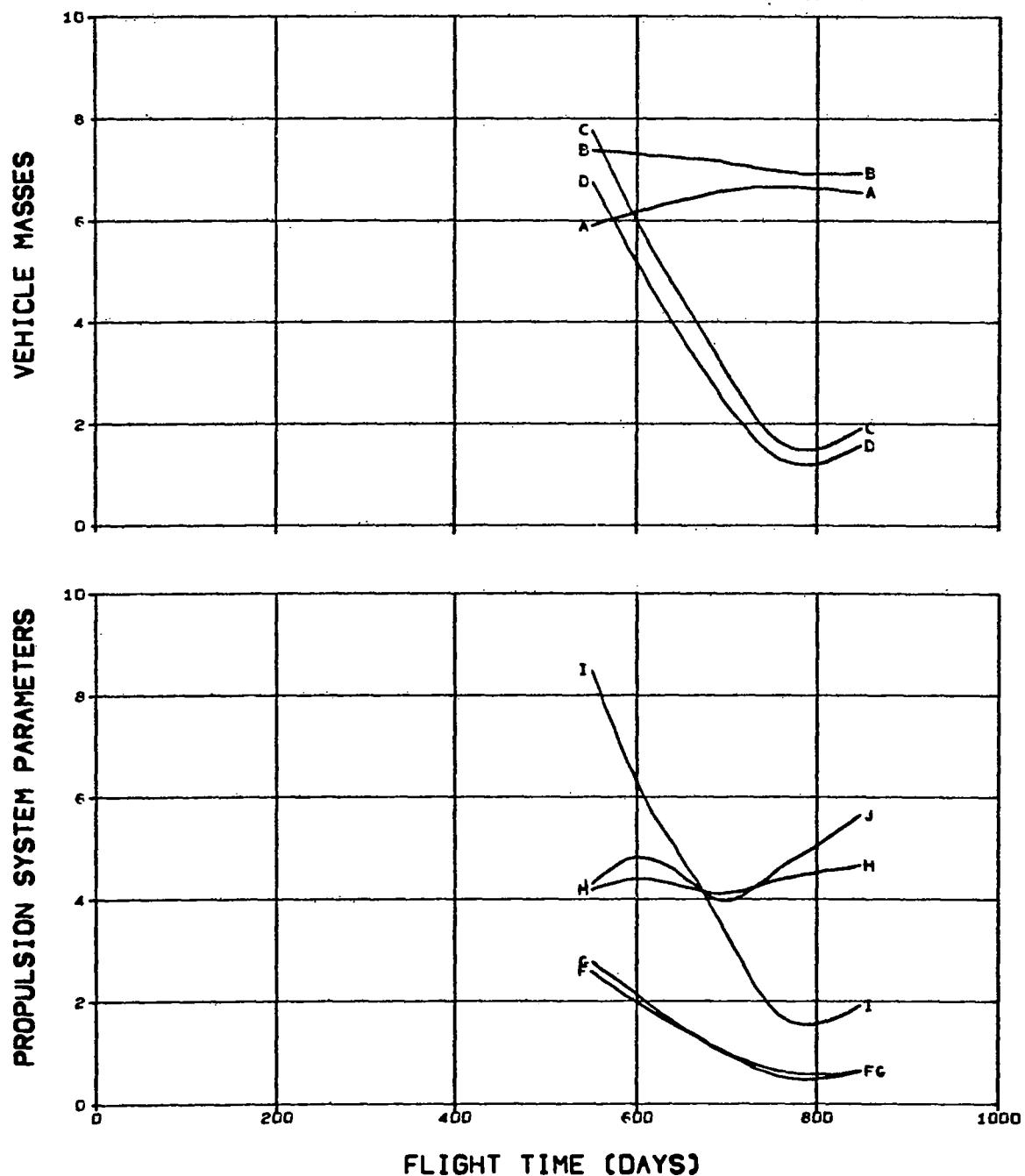


FIG. 3.2.2 MARS MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K. MAXIMUM SOLAR DISTANCE (AU) Q. X-COMPONENT OF PRIMER/1.0DE-1
 L. MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R. Y-COMPONENT OF PRIMER
 M. HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S. X-COMPONENT OF PRIMER DERIVATIVE
 N. LAUNCH EXCESS SPEED (M/SEC)/1000 T. Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O. ARRIVAL EXCESS SPEED (M/SEC)/1000

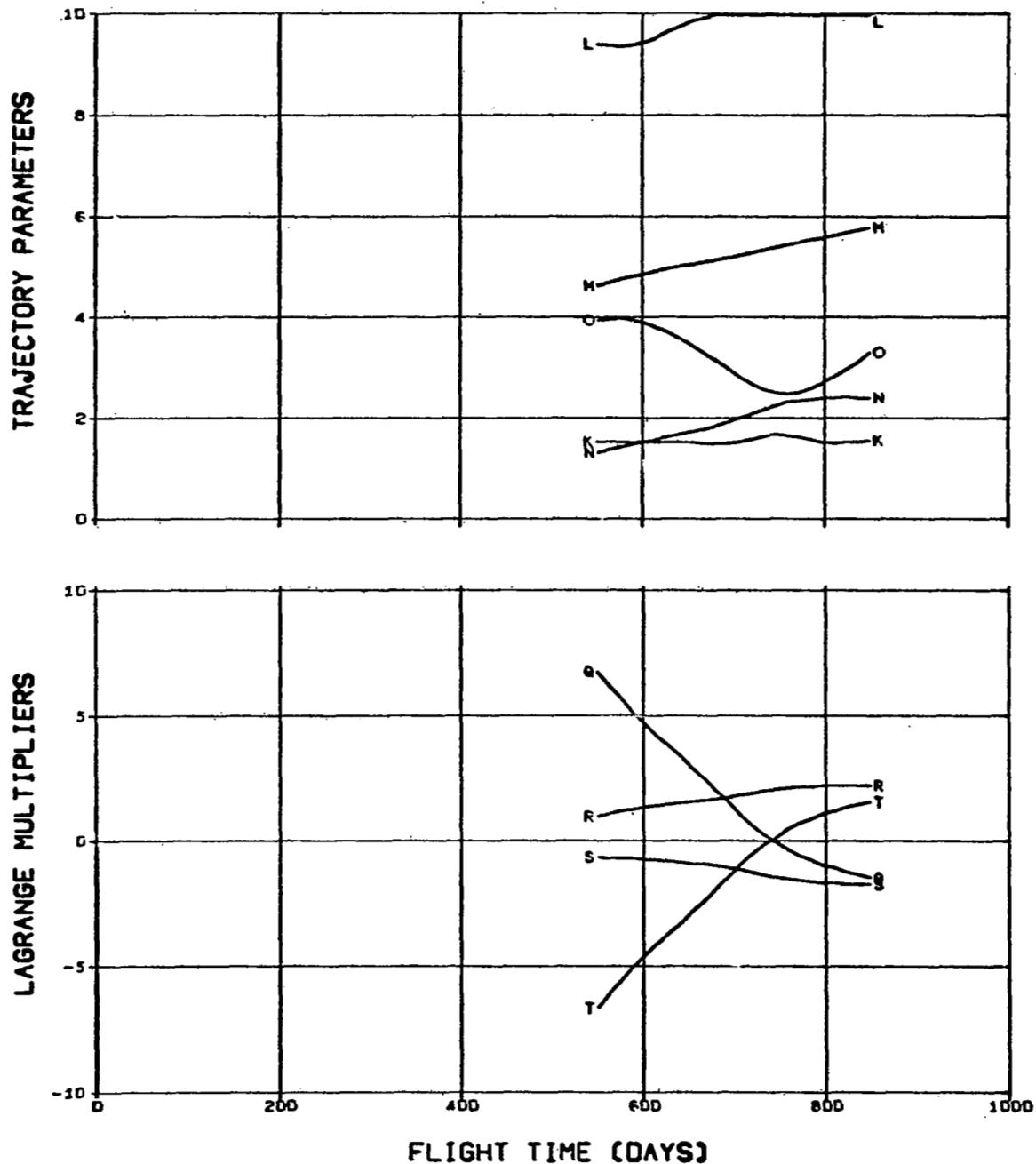


FIG. 3.2.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPULSION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPELLANT TIME (DAYS)/100

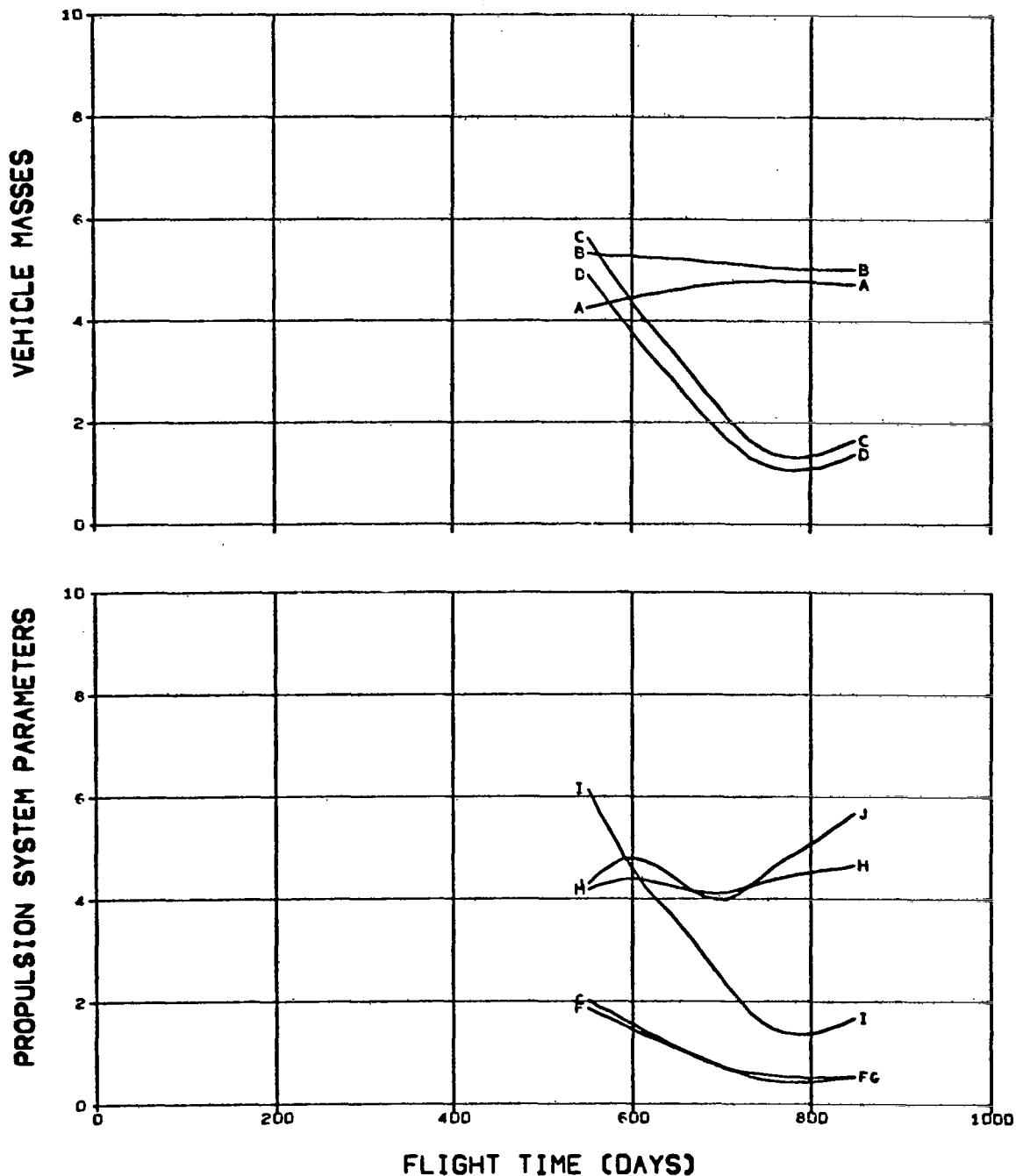


FIG. 3.2.3 MARS MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

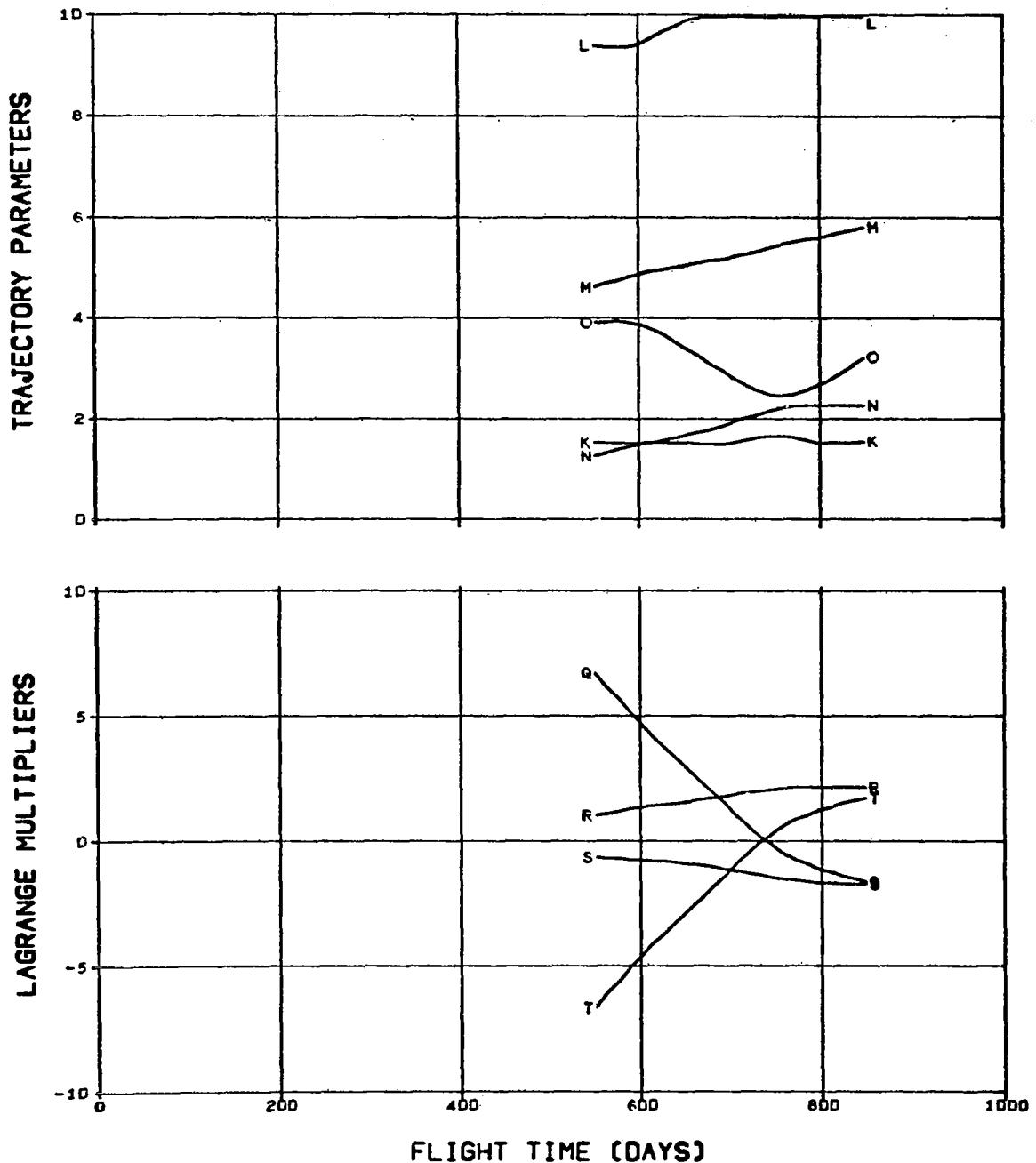


FIG. 3.2.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPELLUTION TIME (DAYS)/100

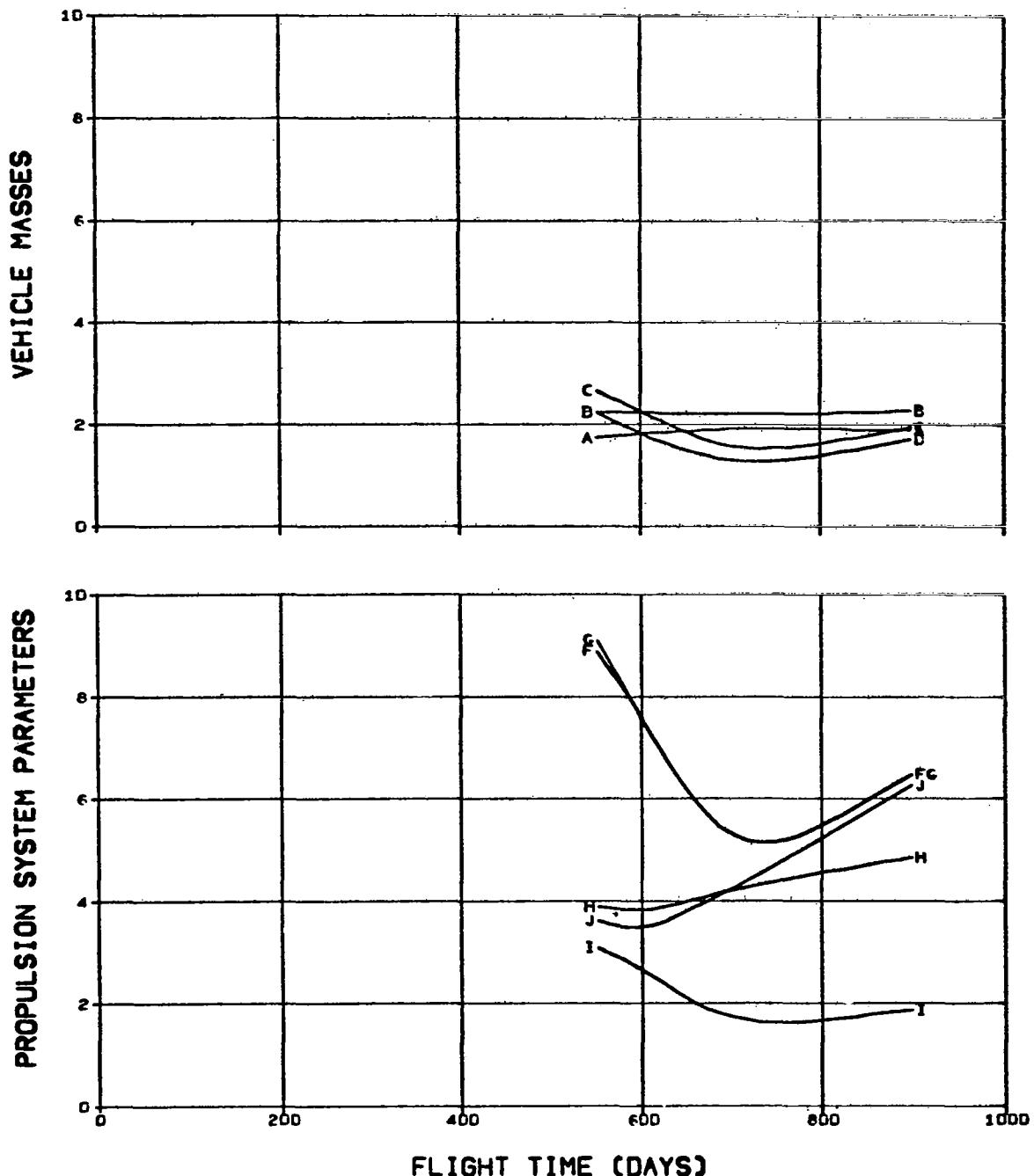


FIG. 3.2.4 MARS MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/100	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

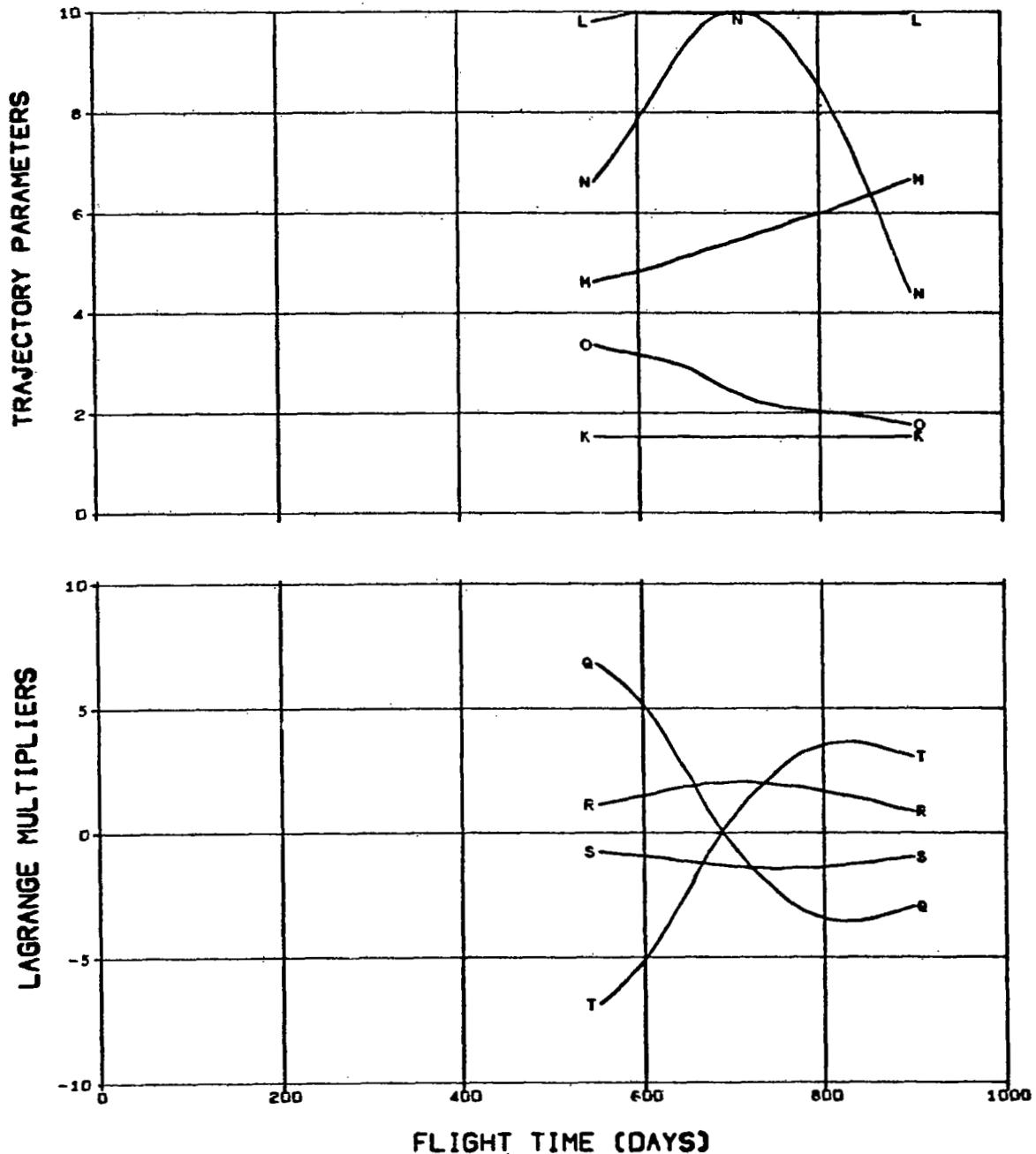


FIG. 3.2.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLUTION TIME (DAYS)/100

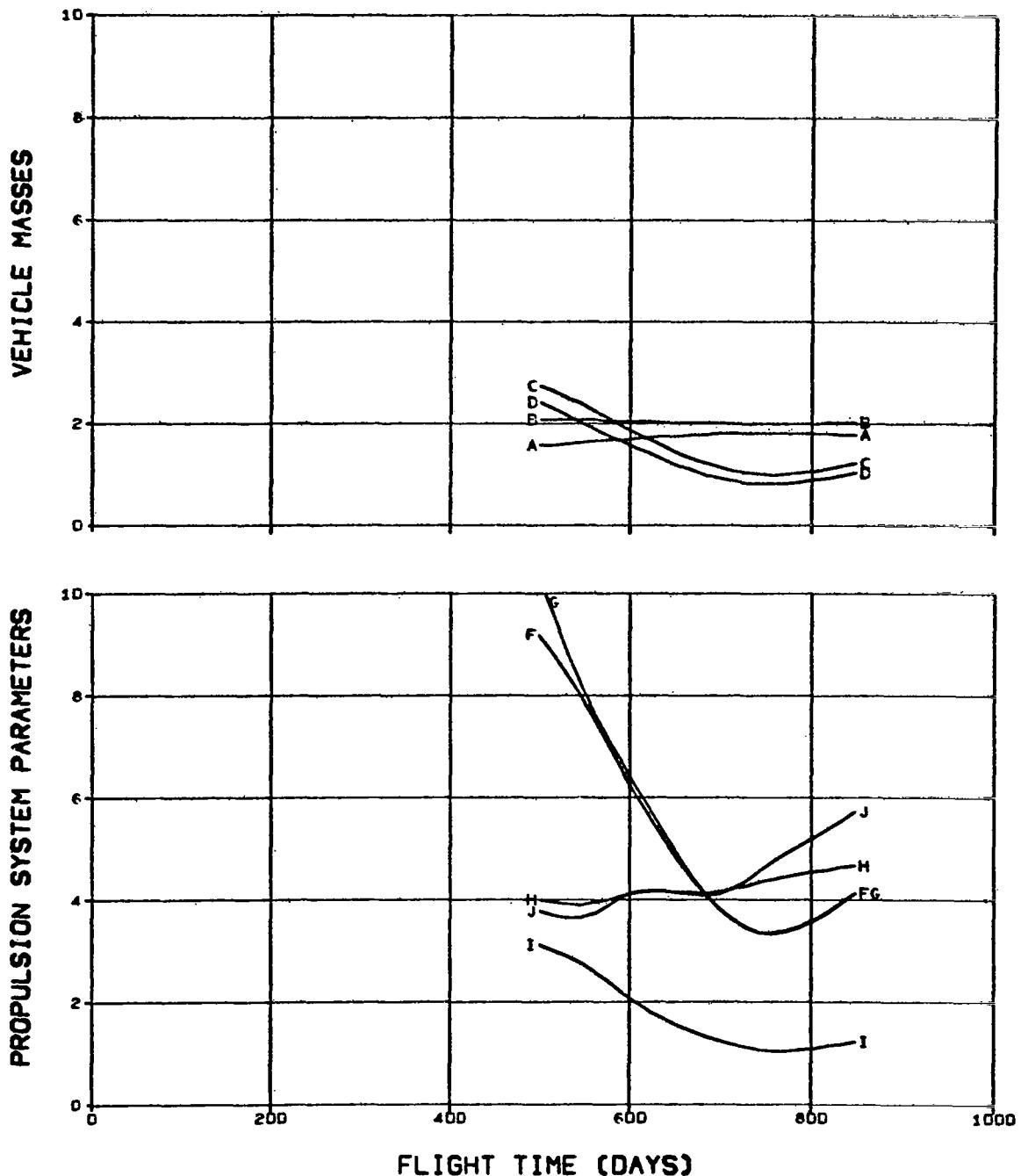


FIG. 3.2.5 MARS MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

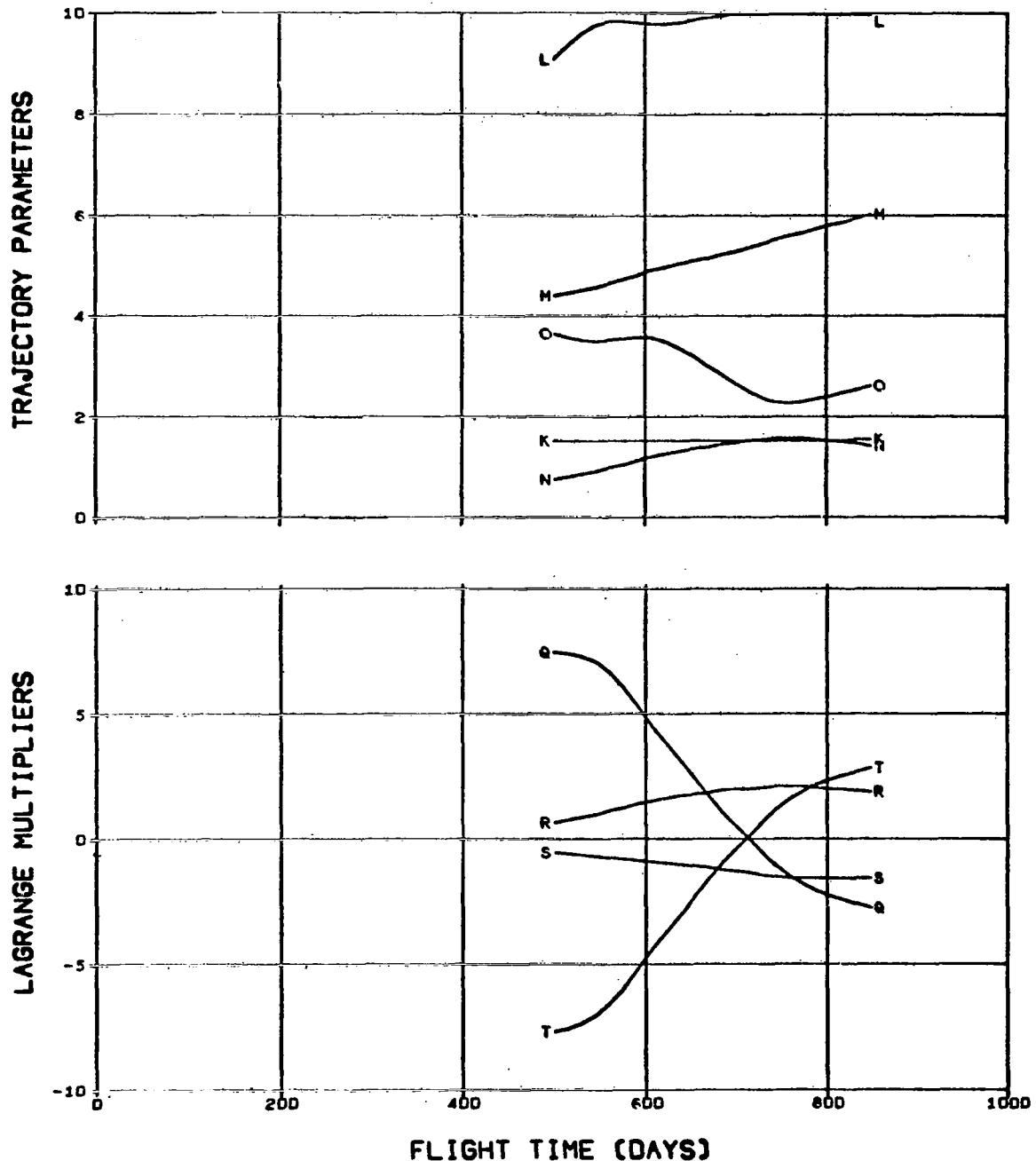


FIG. 3.2.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPULSION TIME (DAYS)/100

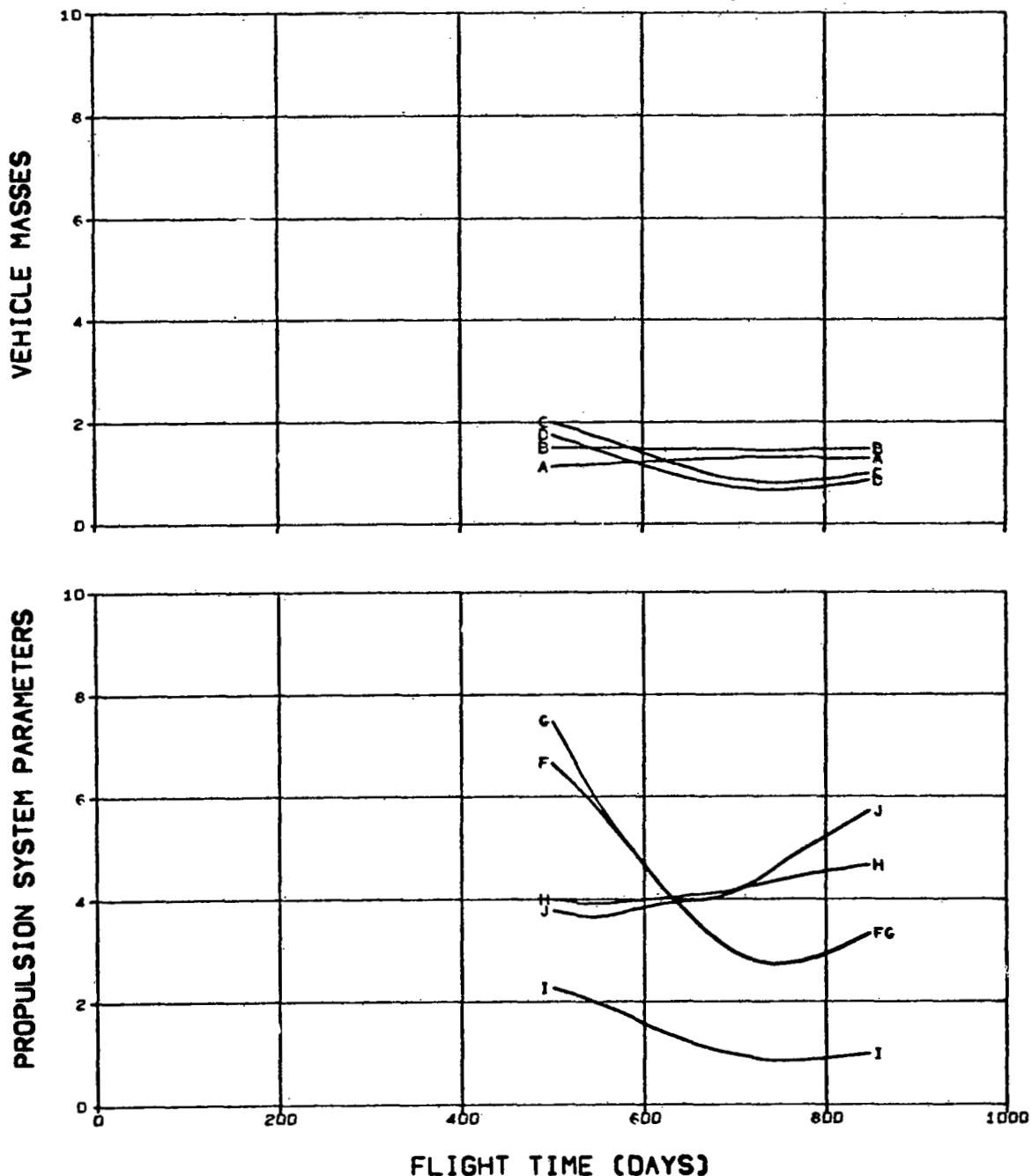


FIG. 3.2.6 MARS MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL-EXCESS SPEED (M/SEC)/1000

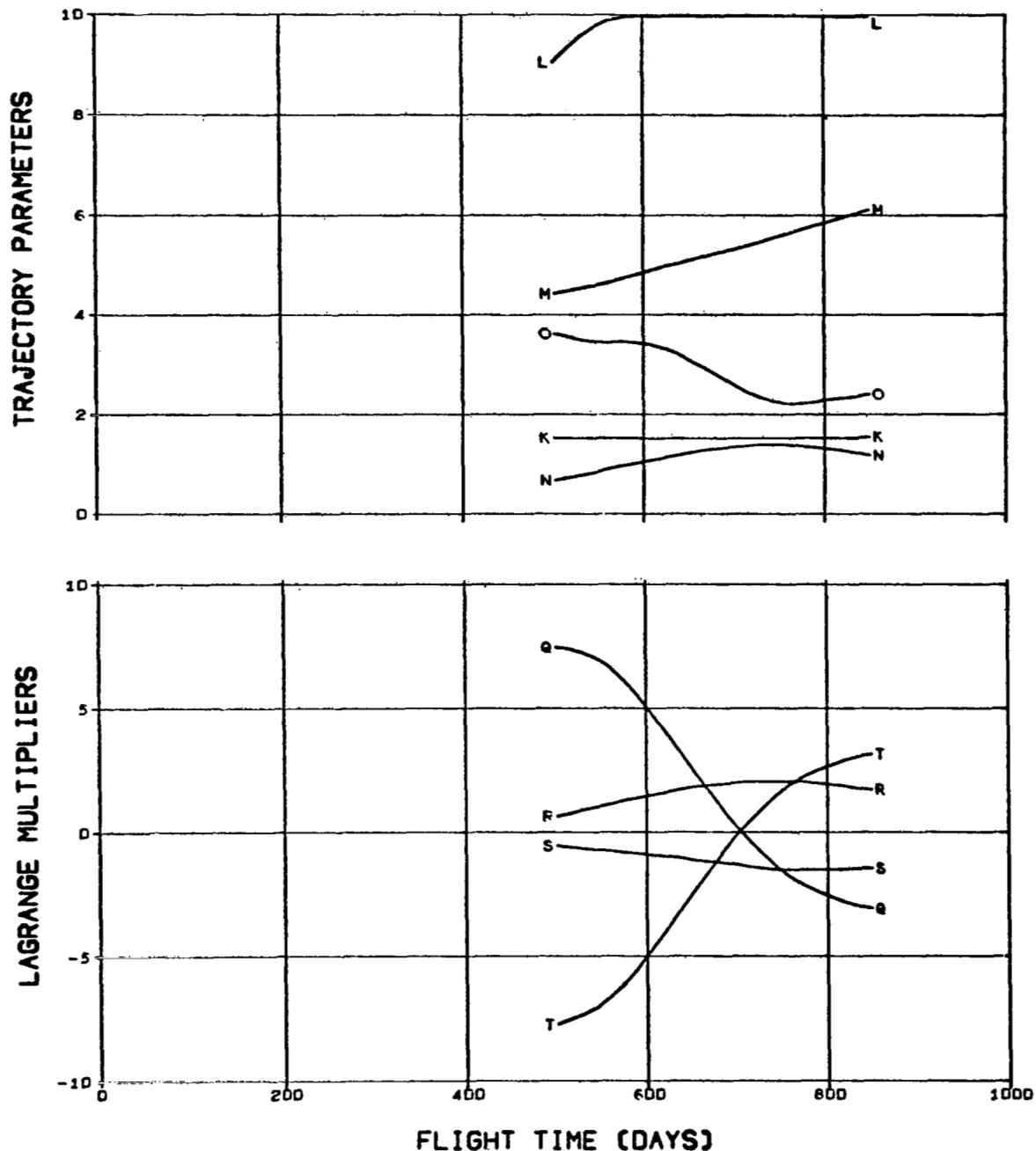


FIG. 3.2.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/10000	J	PROPULSION TIME (DAYS)/100

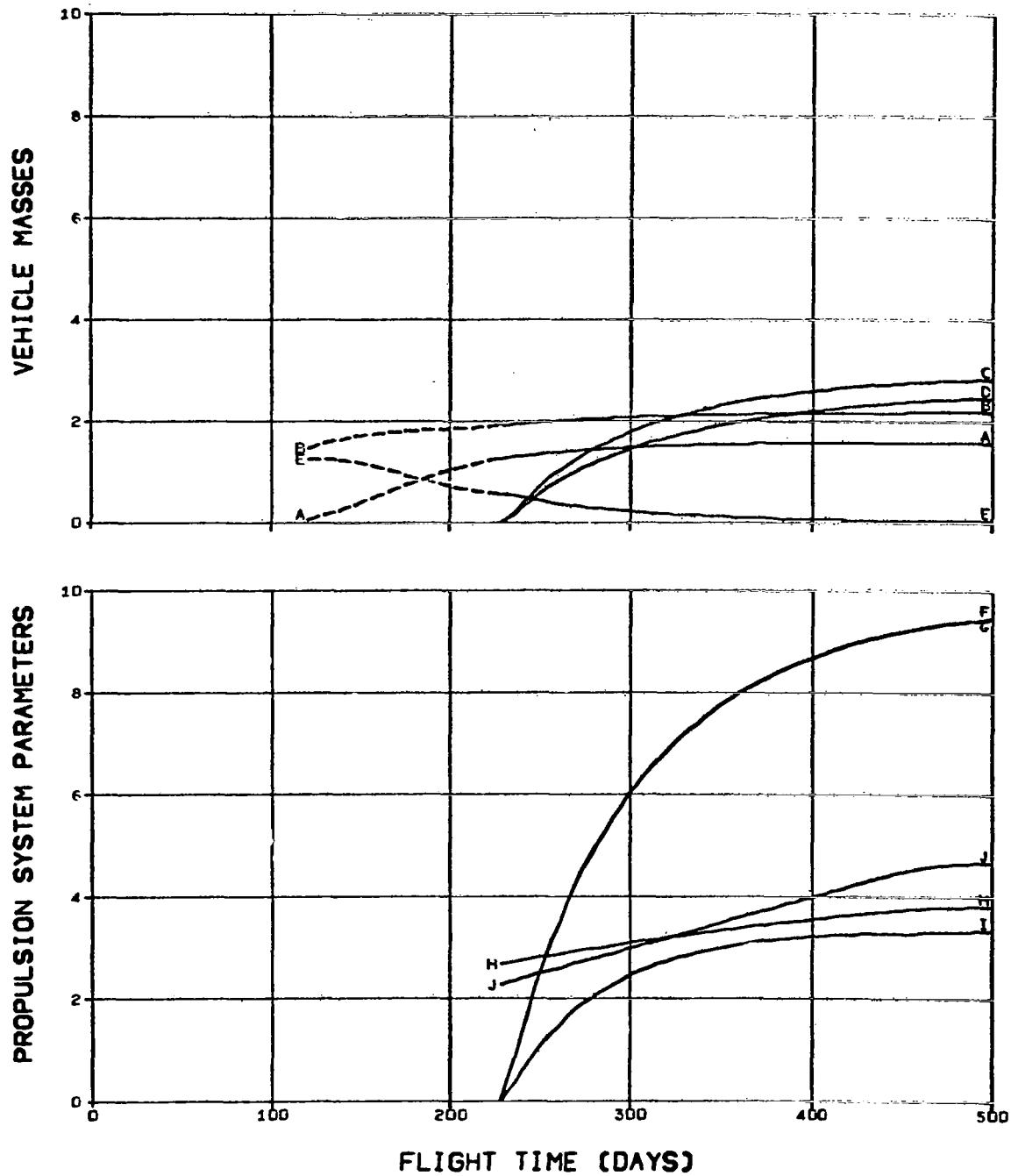


FIG. 3.3.1 MARS MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

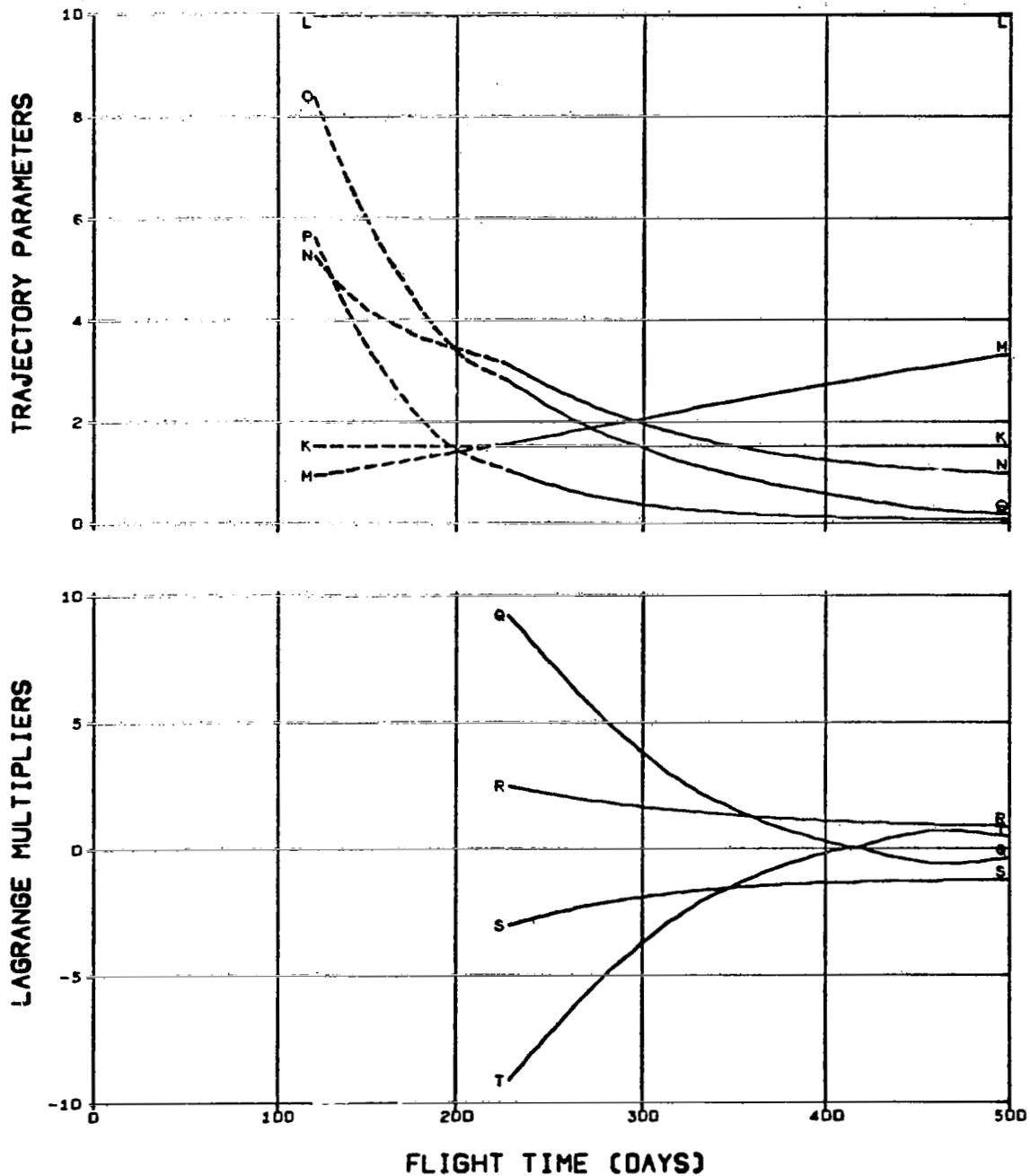
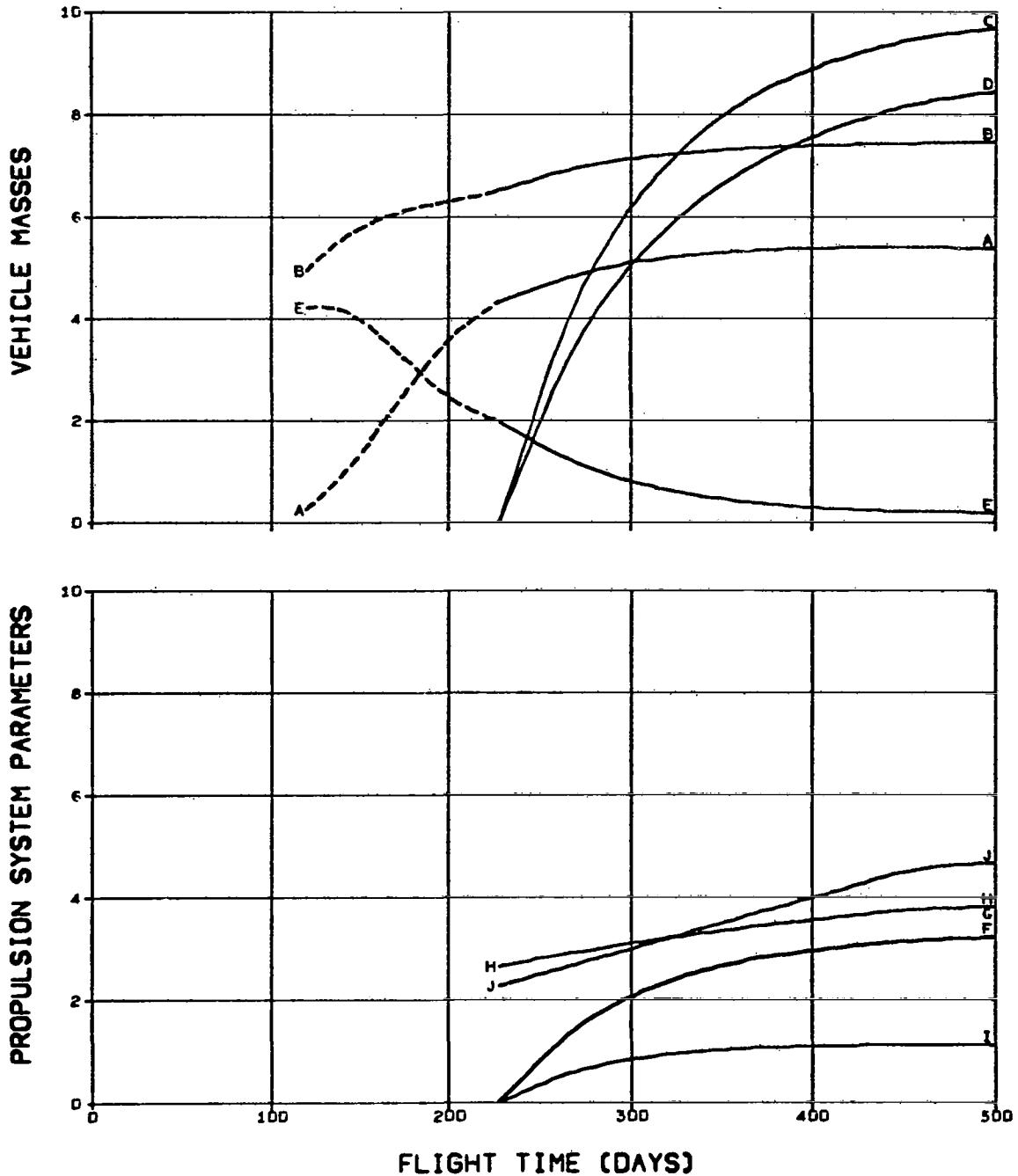


FIG. 3.3.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/100



**FIG. 3.3.2 MARS MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) F RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 G X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

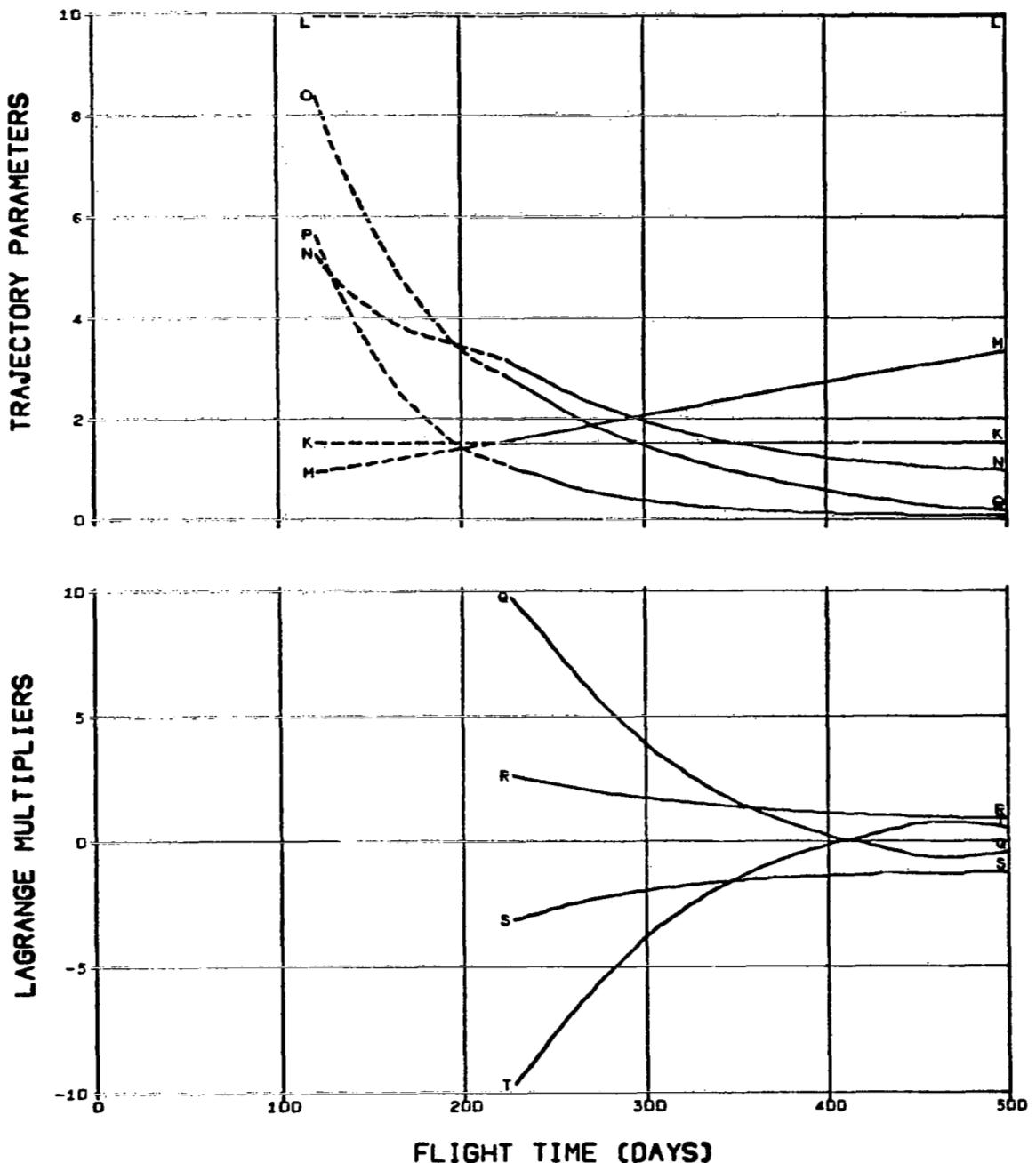
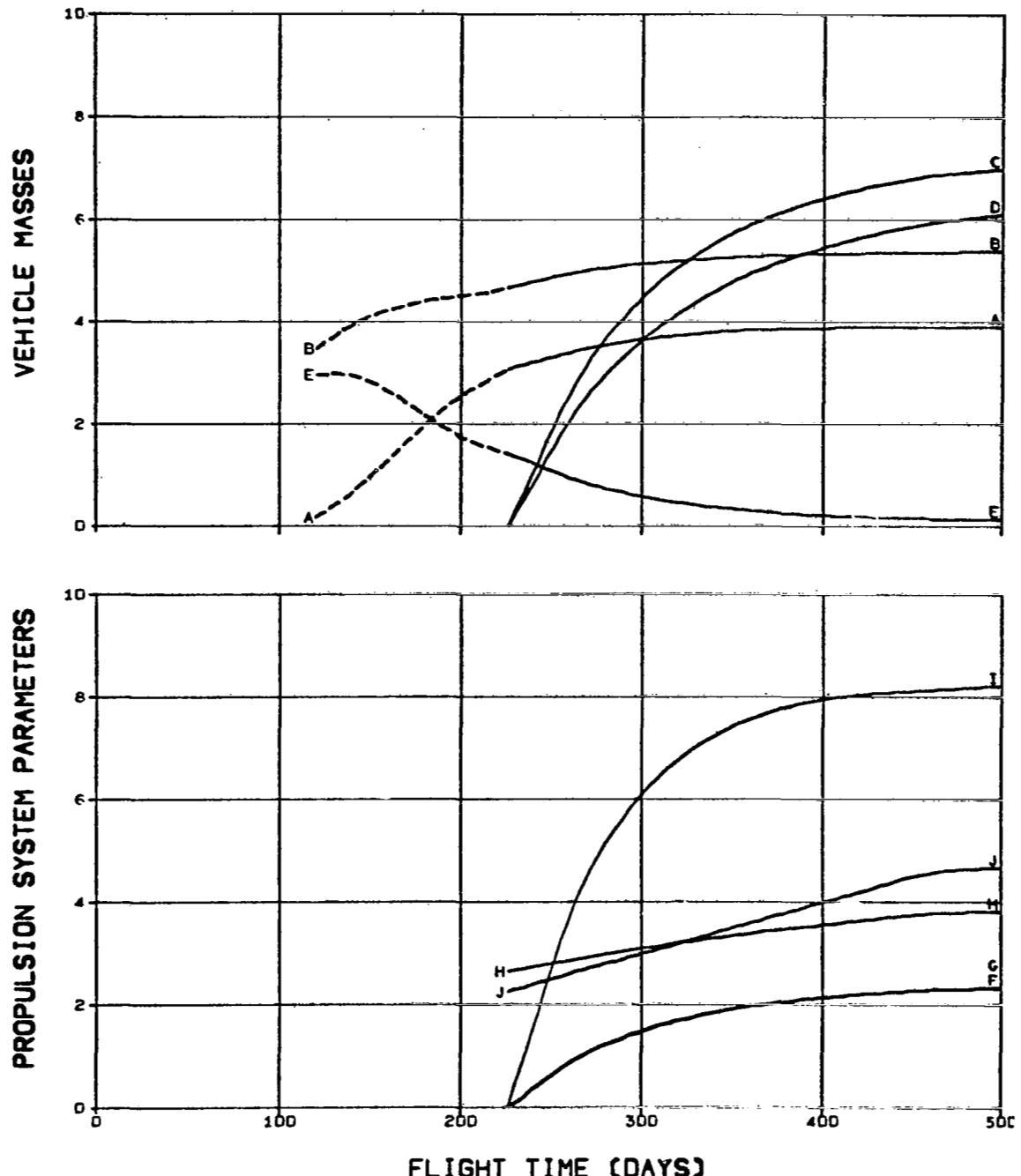


FIG. 3.3.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/100



**FIG. 3.3.3 MARS MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.00E-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

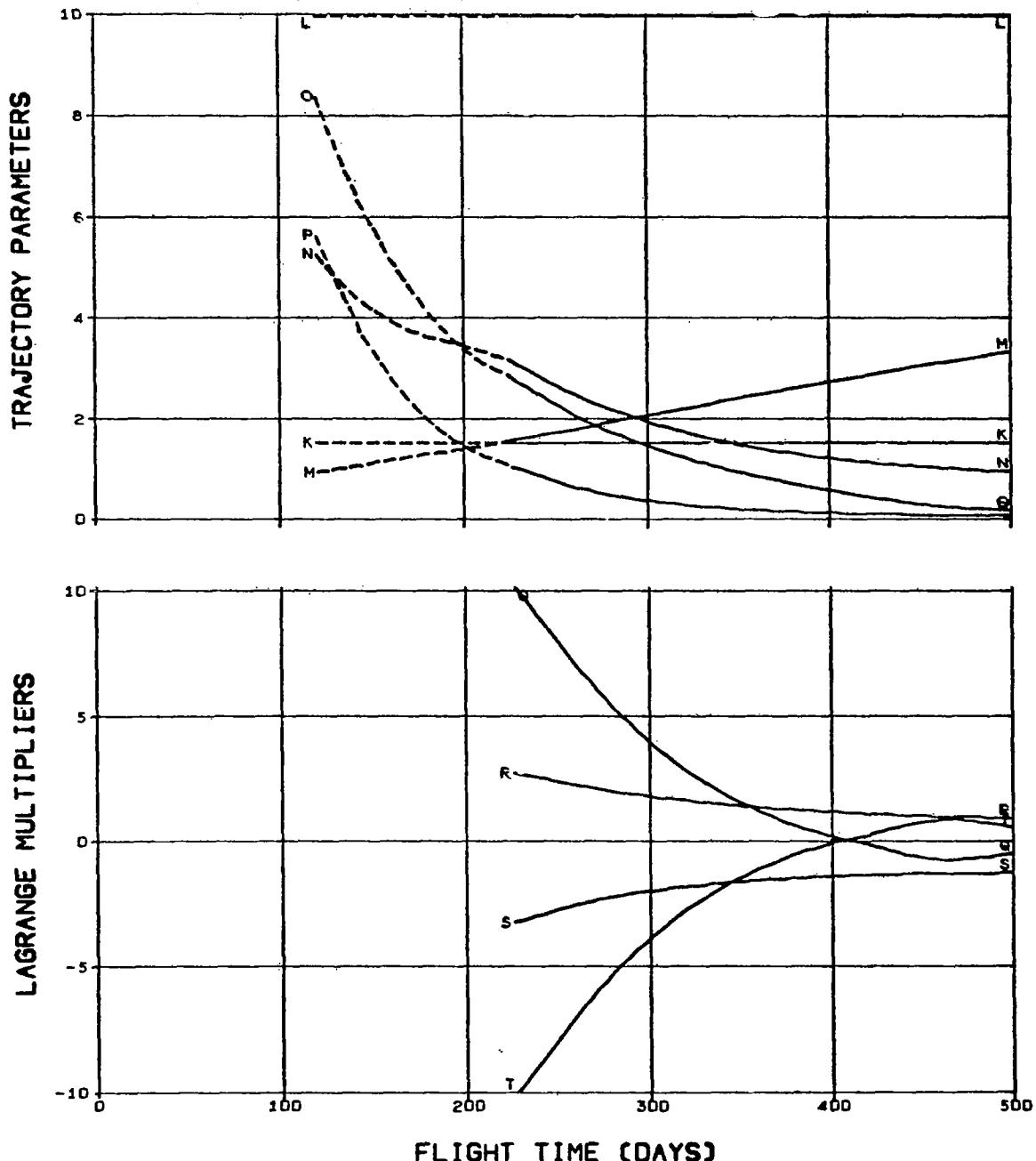
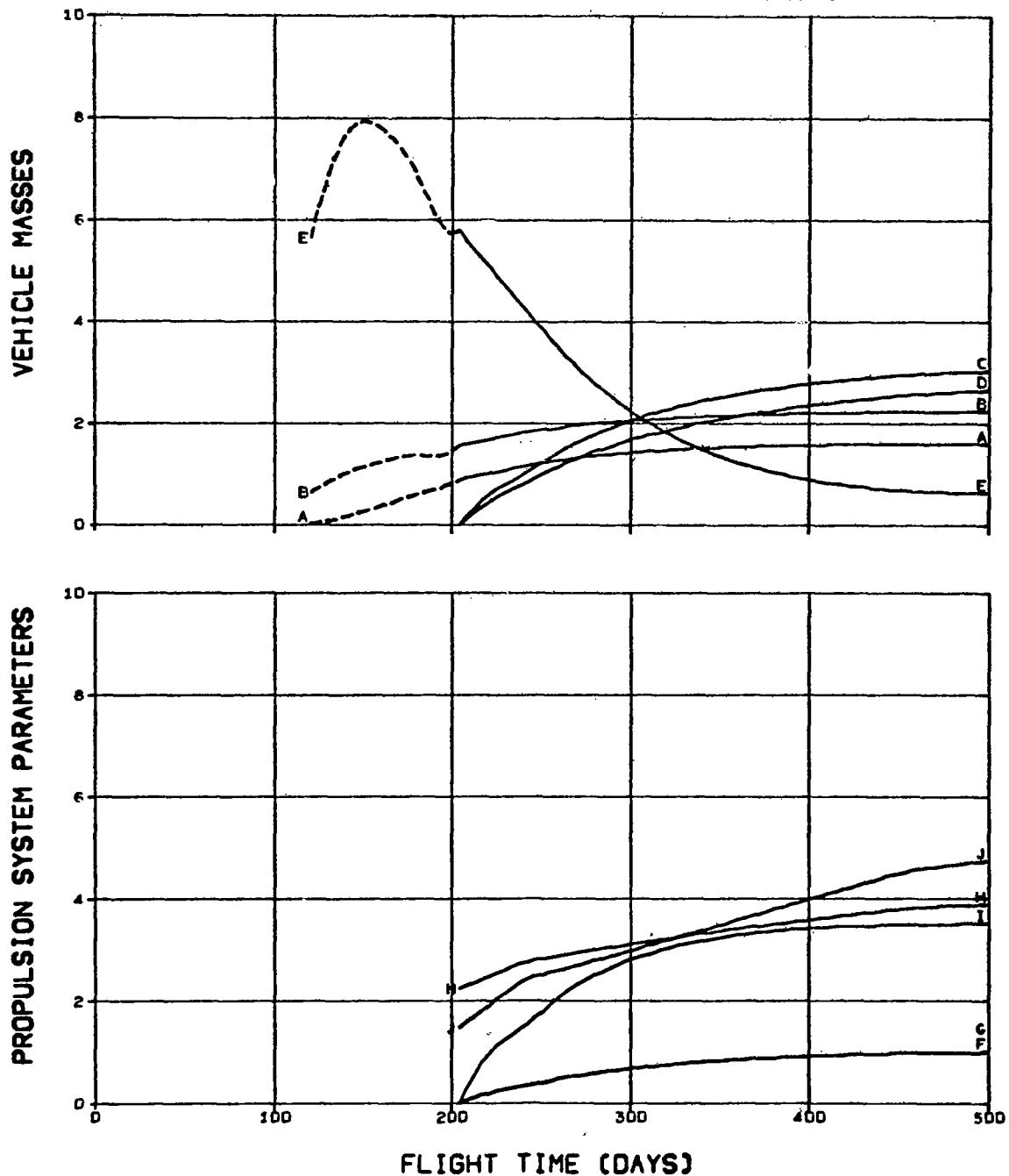


FIG. 3.3.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLION TIME (DAYS)/100



**FIG. 3.3.4 MARS MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

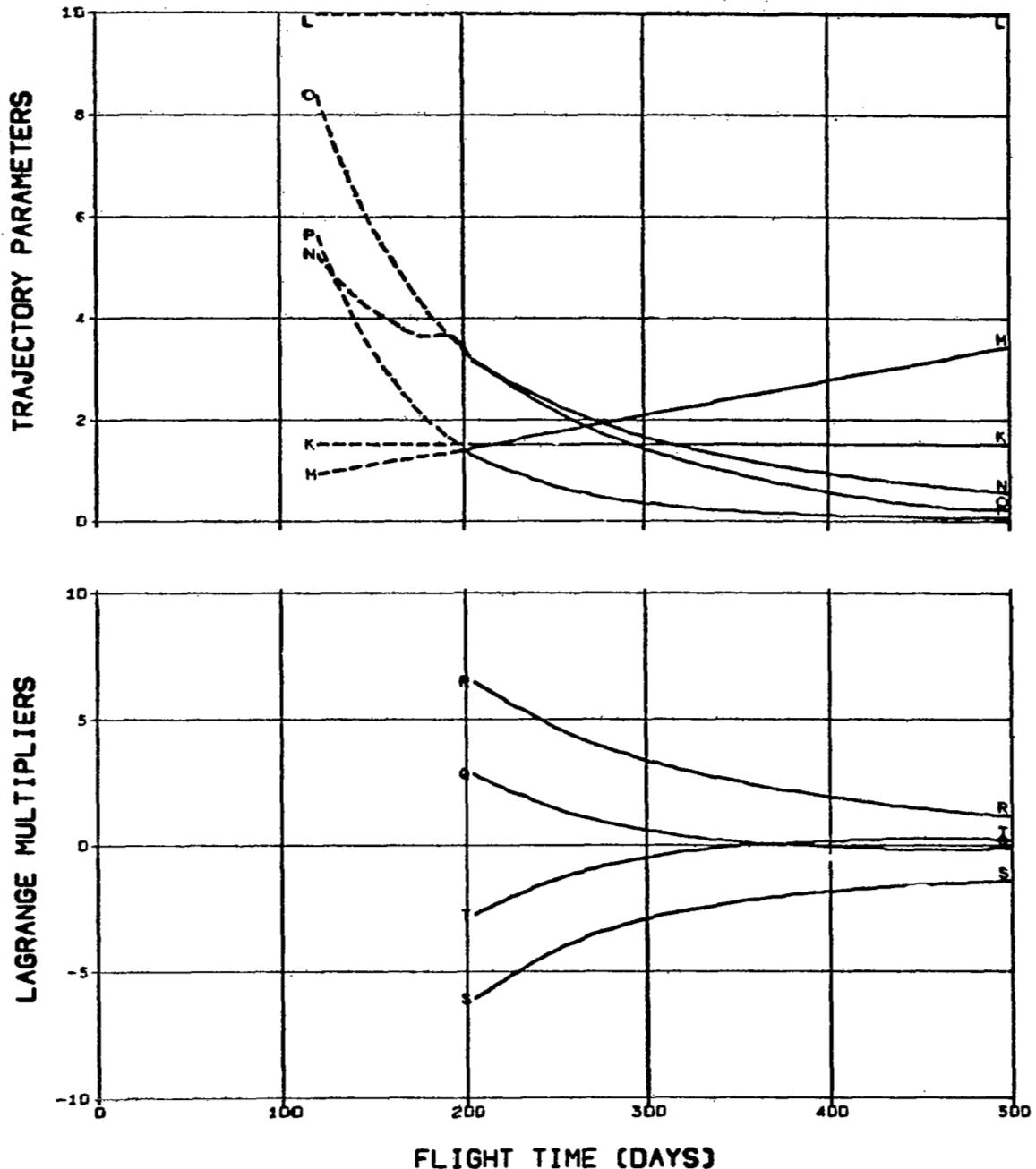
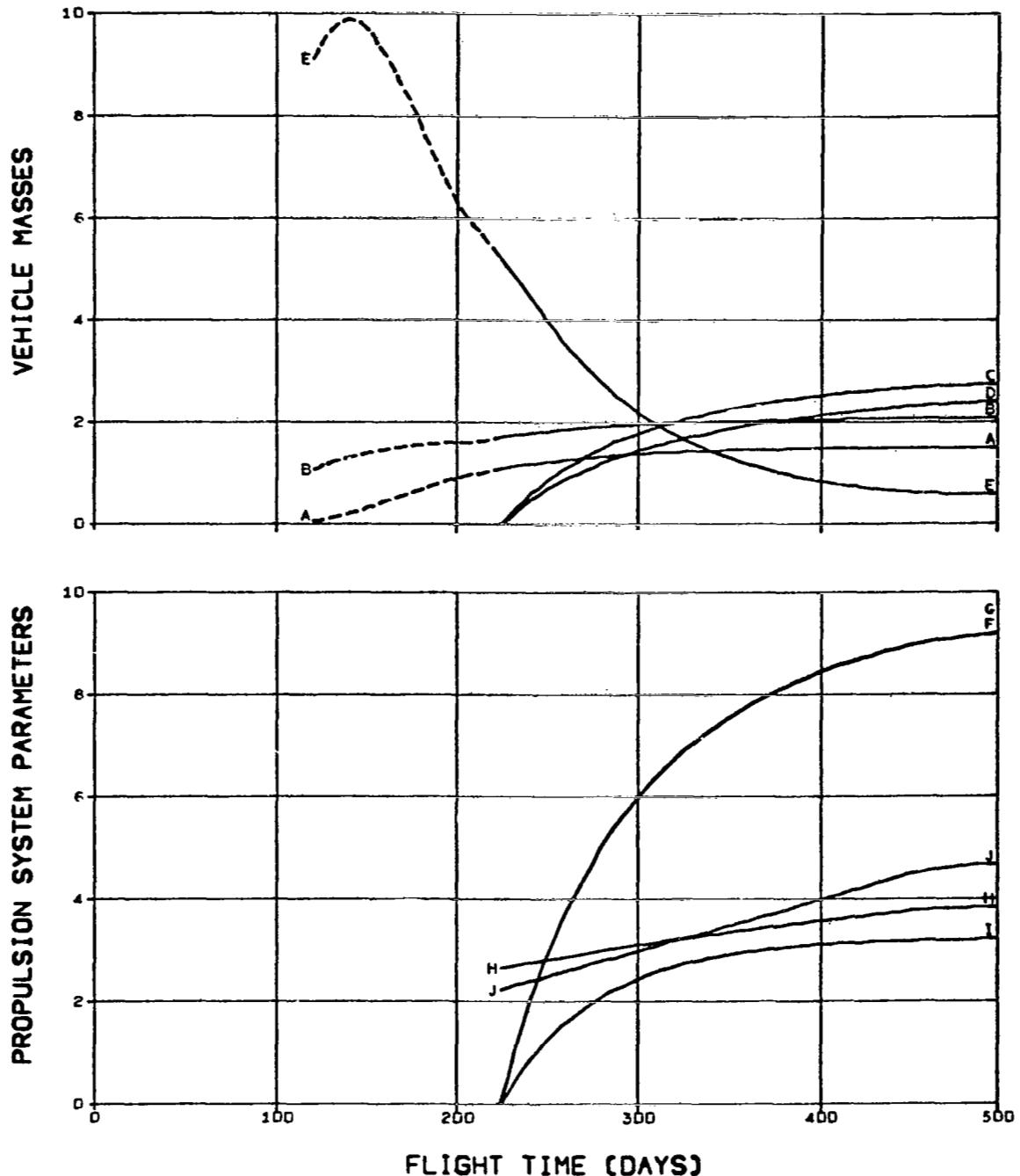


FIG. 3.3.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 3.3.5 MARS MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

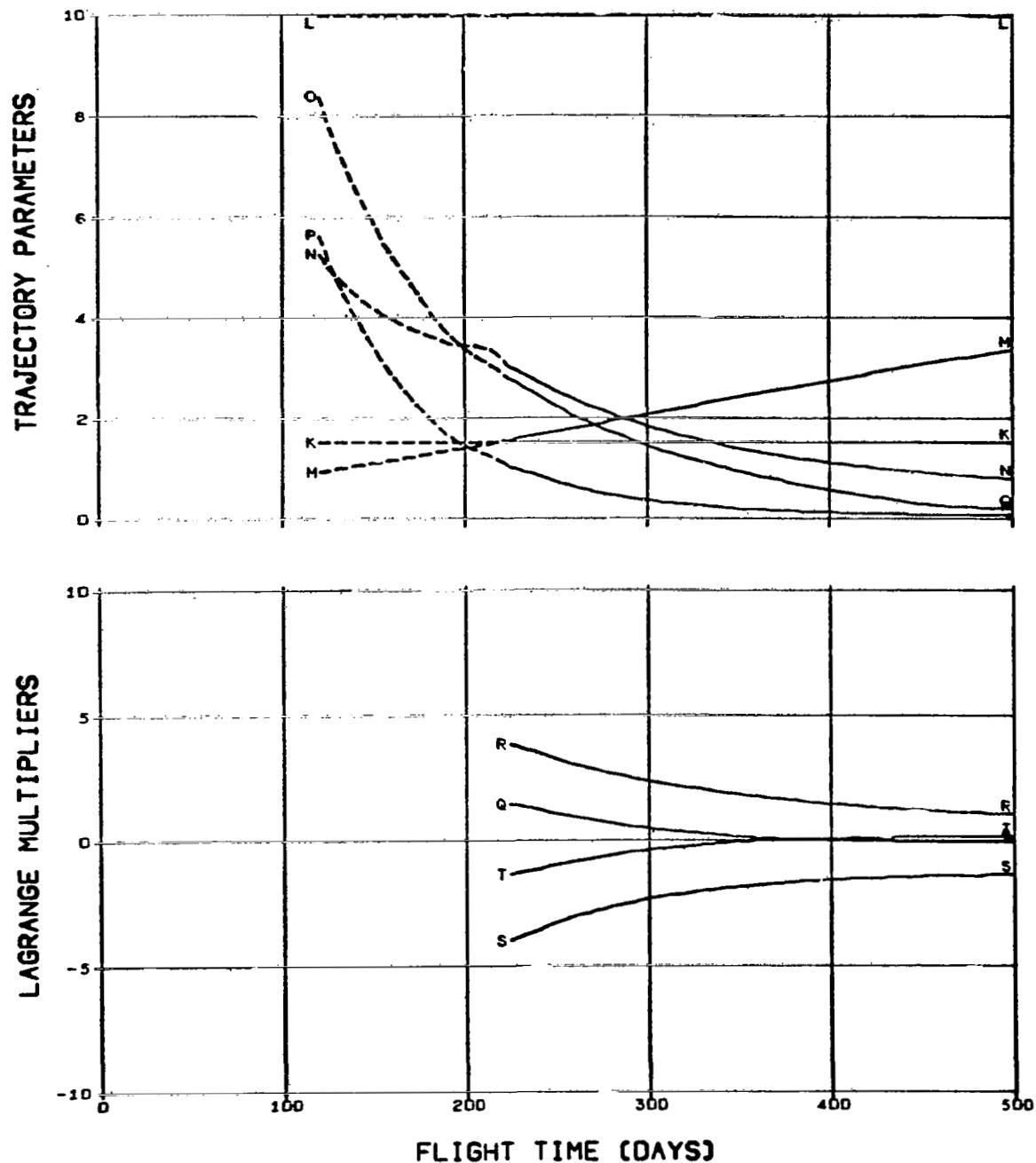
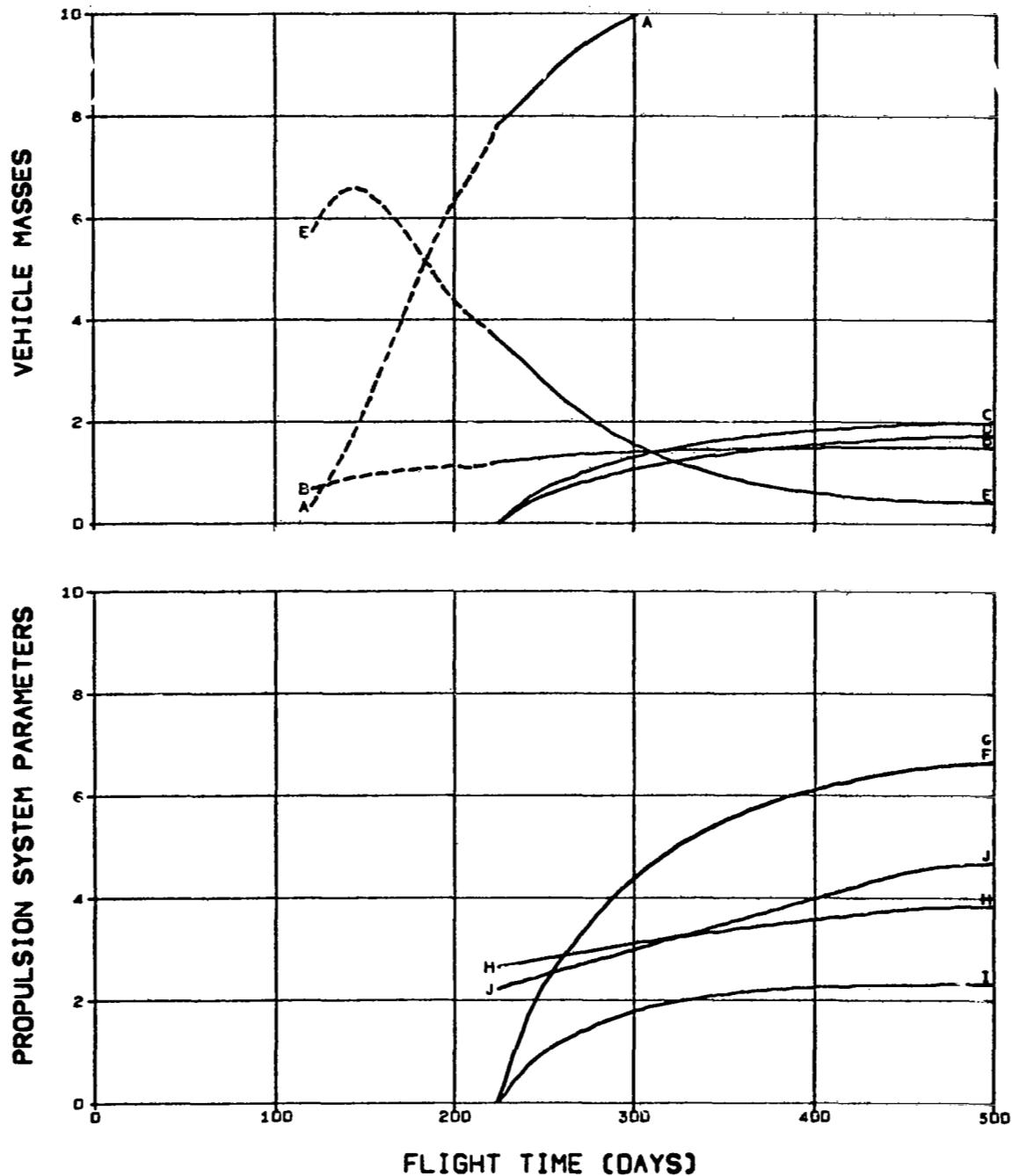


FIG. 3.3.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 3.3.6 MARS MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

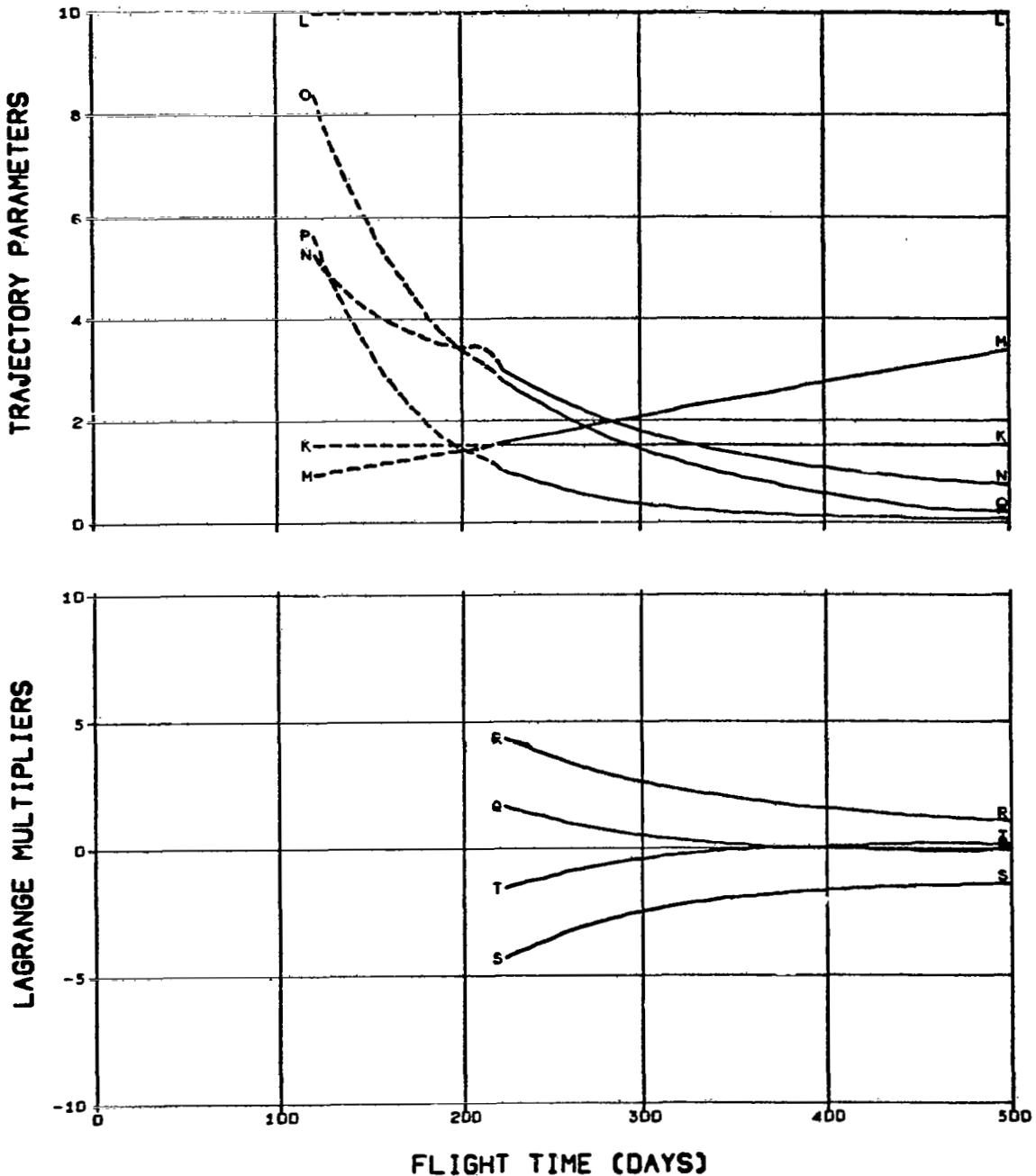
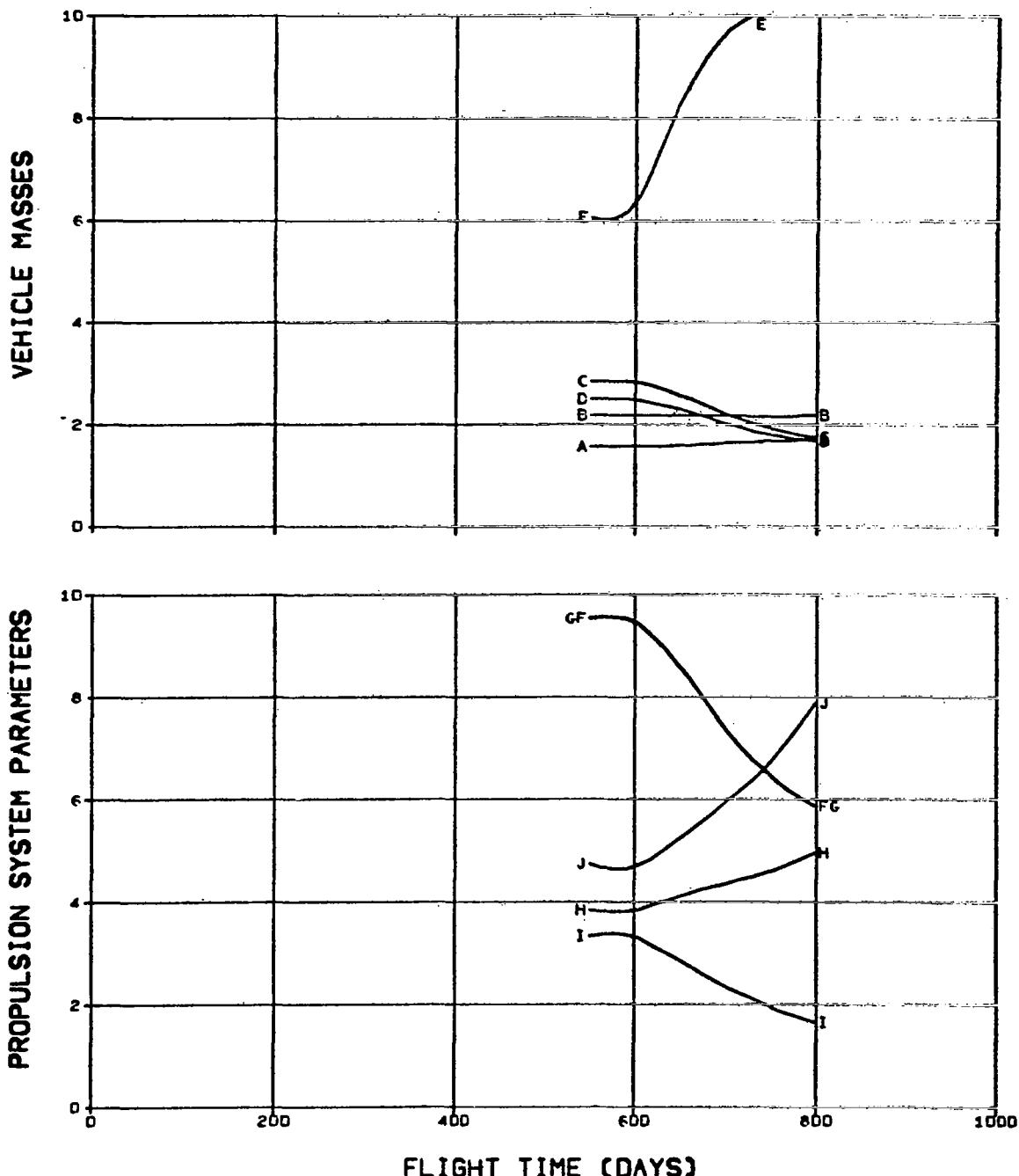


FIG. 3.3.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 3.5.1 MARS MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPERIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/1.00E-1
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

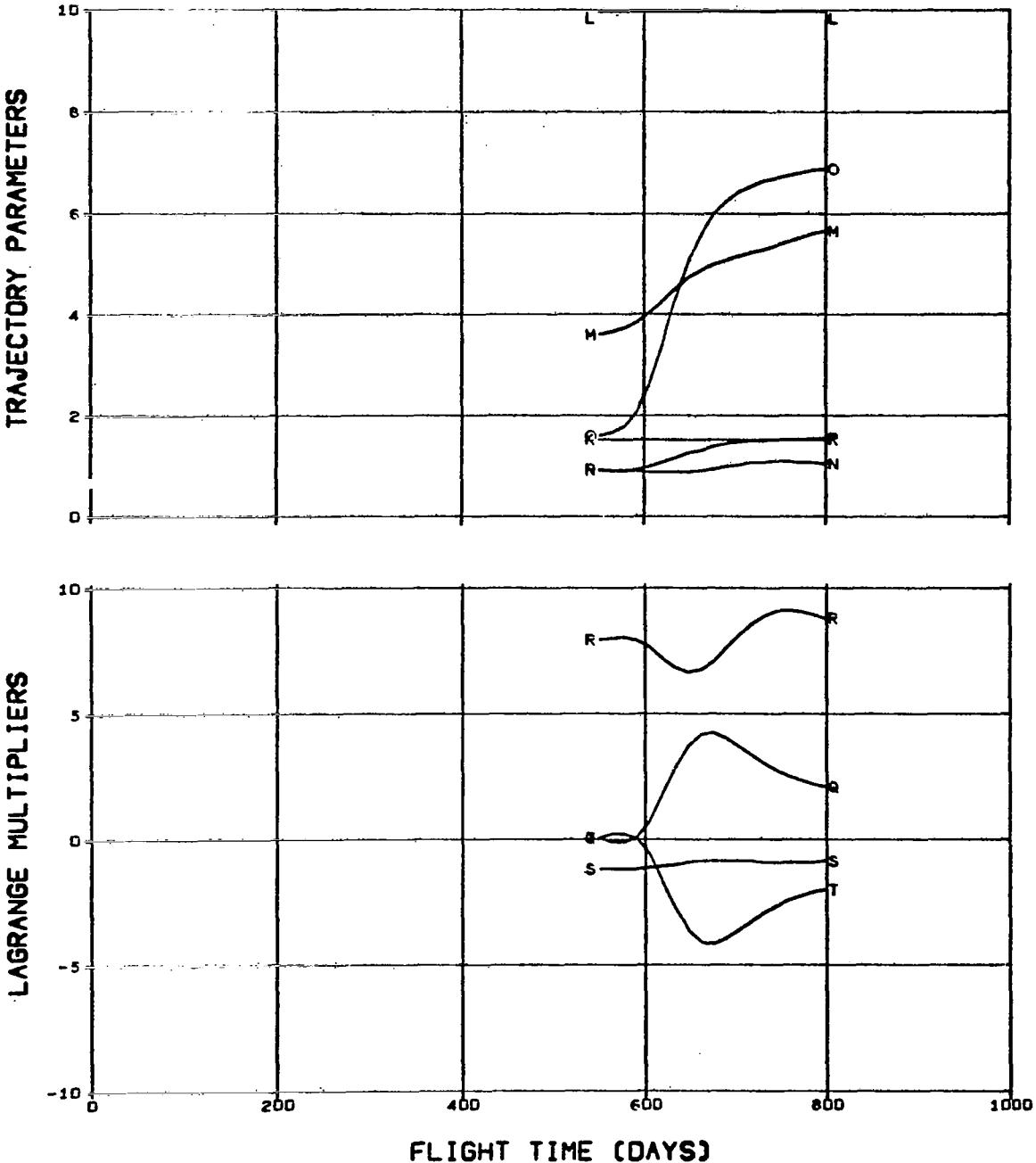
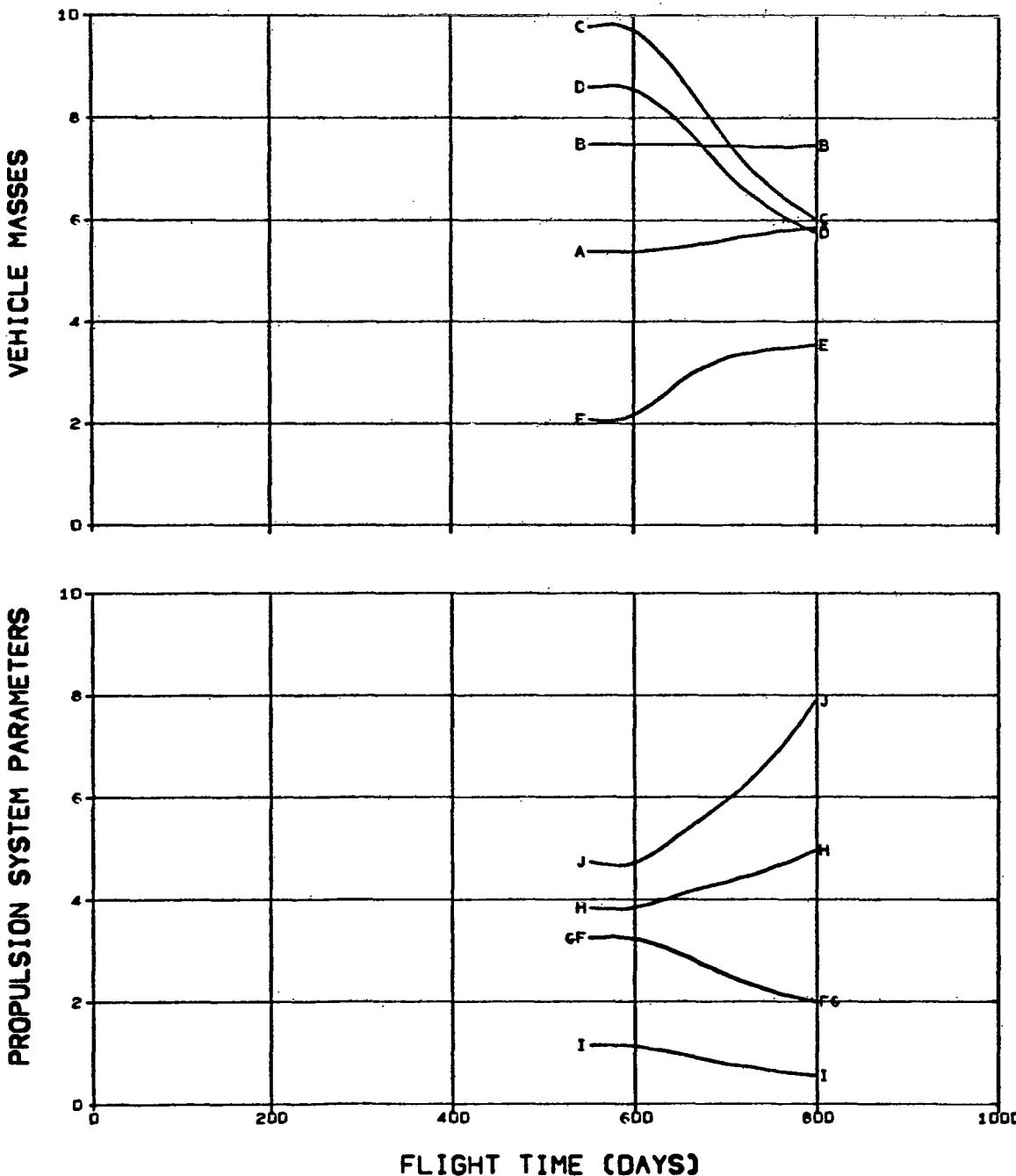


FIG. 3.5.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/100



**FIG. 3.5.2 MARS MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	B	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	C	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	D	Y-COMPONENT OF PRIMER/1.0DE-1
N	LAUNCH EXCESS SPEED (M/SEC)/1000	E	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100	F	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

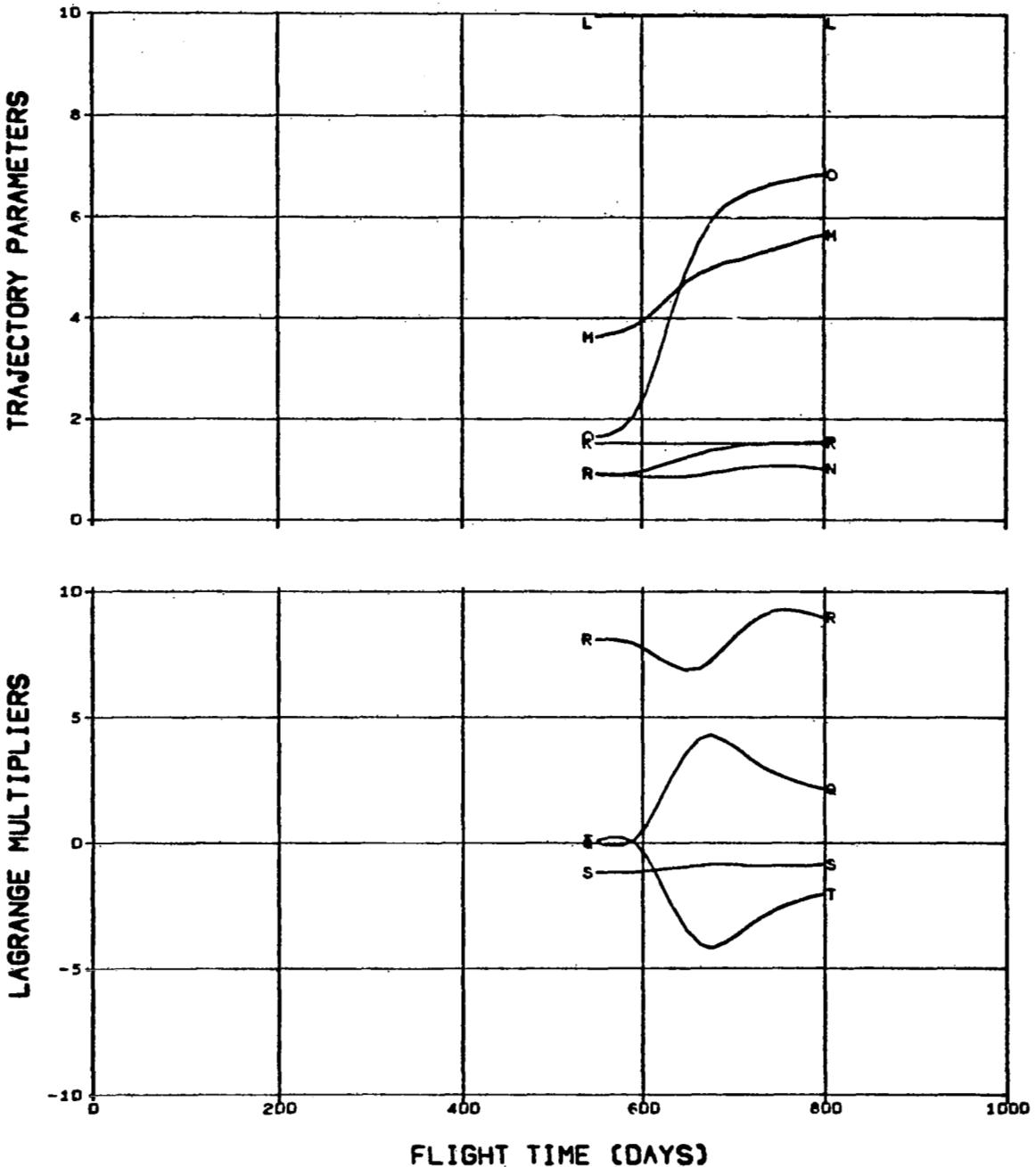


FIG. 3.5.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100

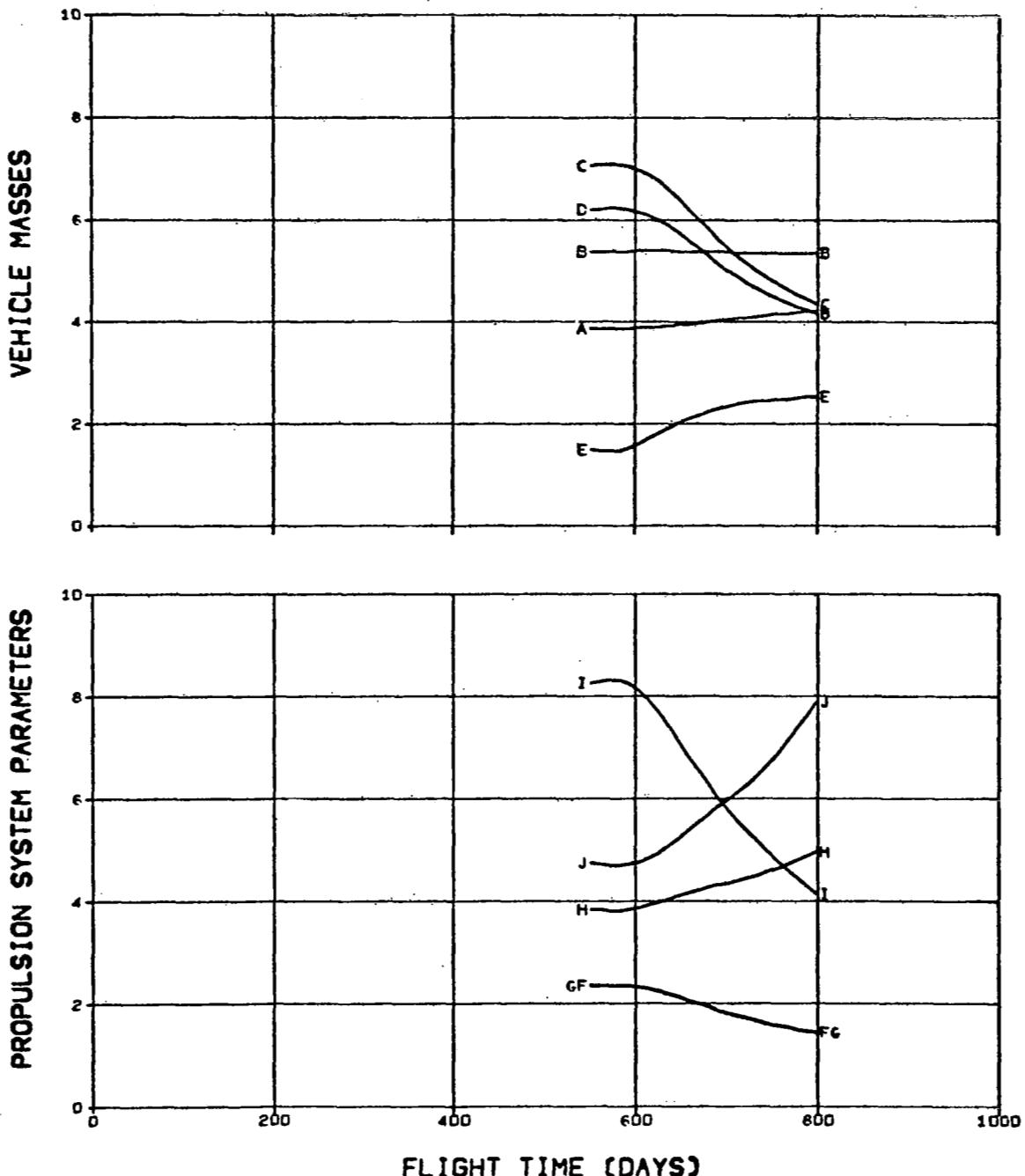


FIG. 3.5.3 MARS MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/100
 P RETRO INCREMENTAL SPEED (M/SEC)/100
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER/1.0DE-1
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

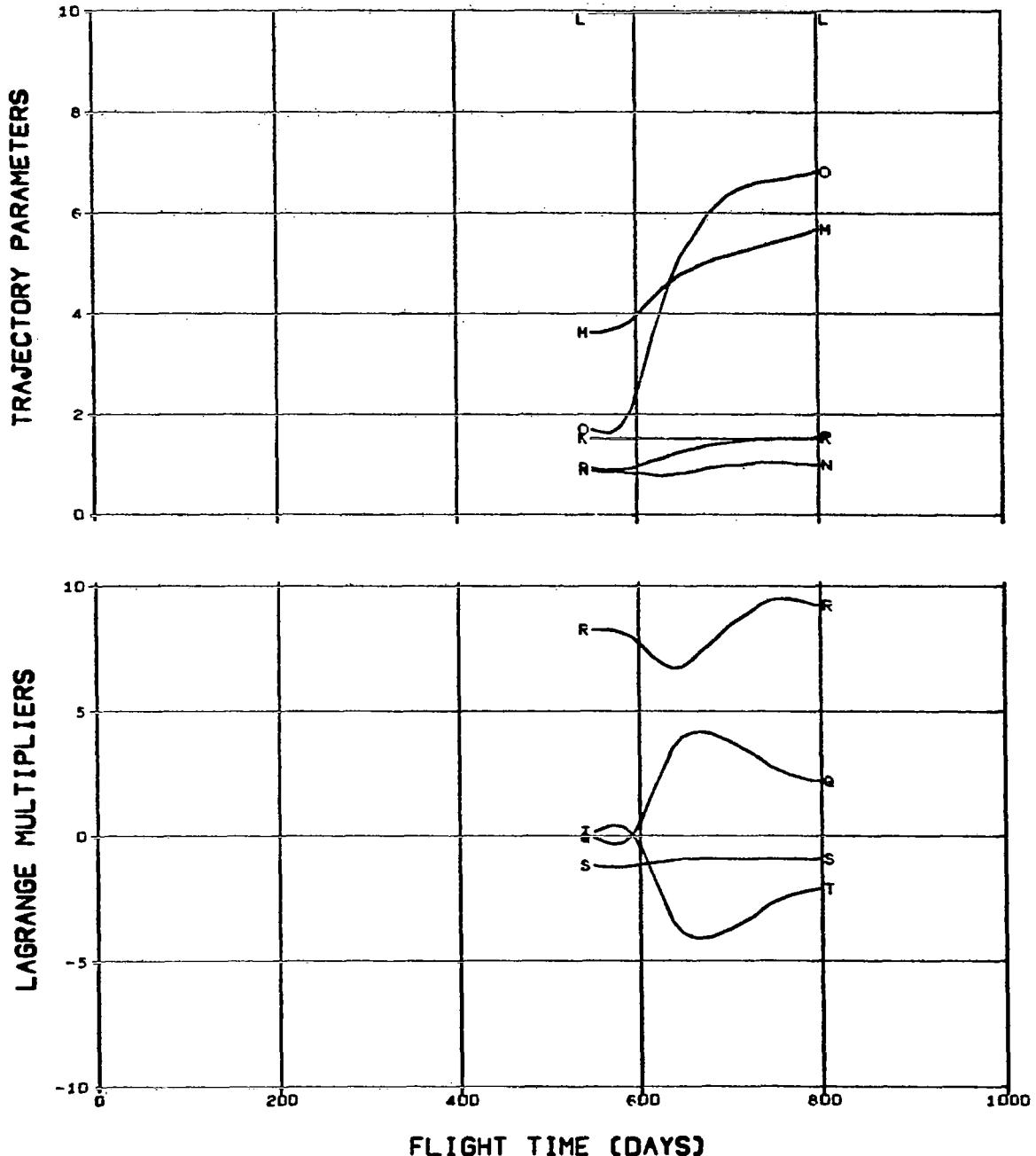


FIG. 3.5.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/10	J	PROPULSION TIME (DAYS)/100

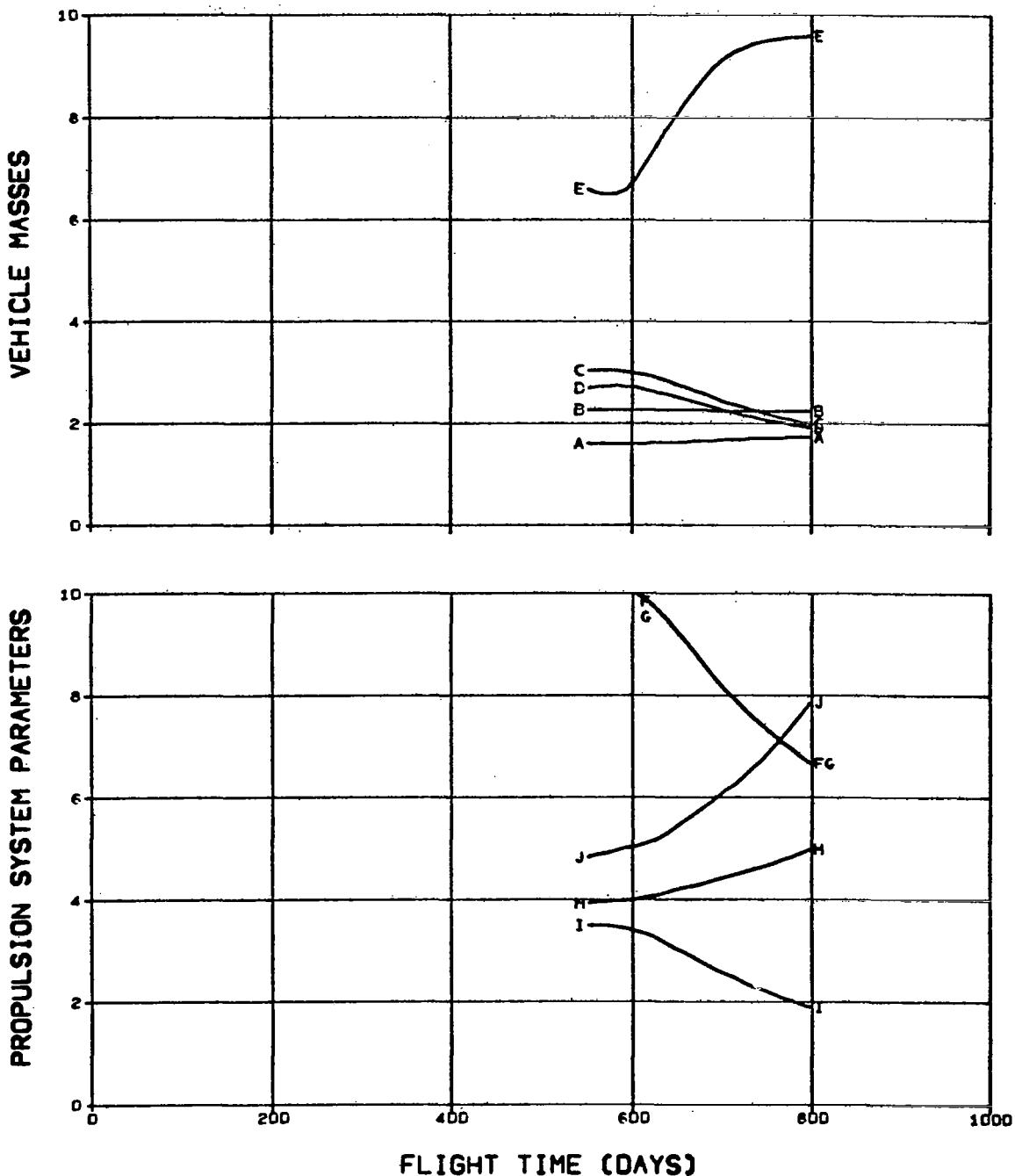


FIG. 3.5.4 MARS MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPERTHIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

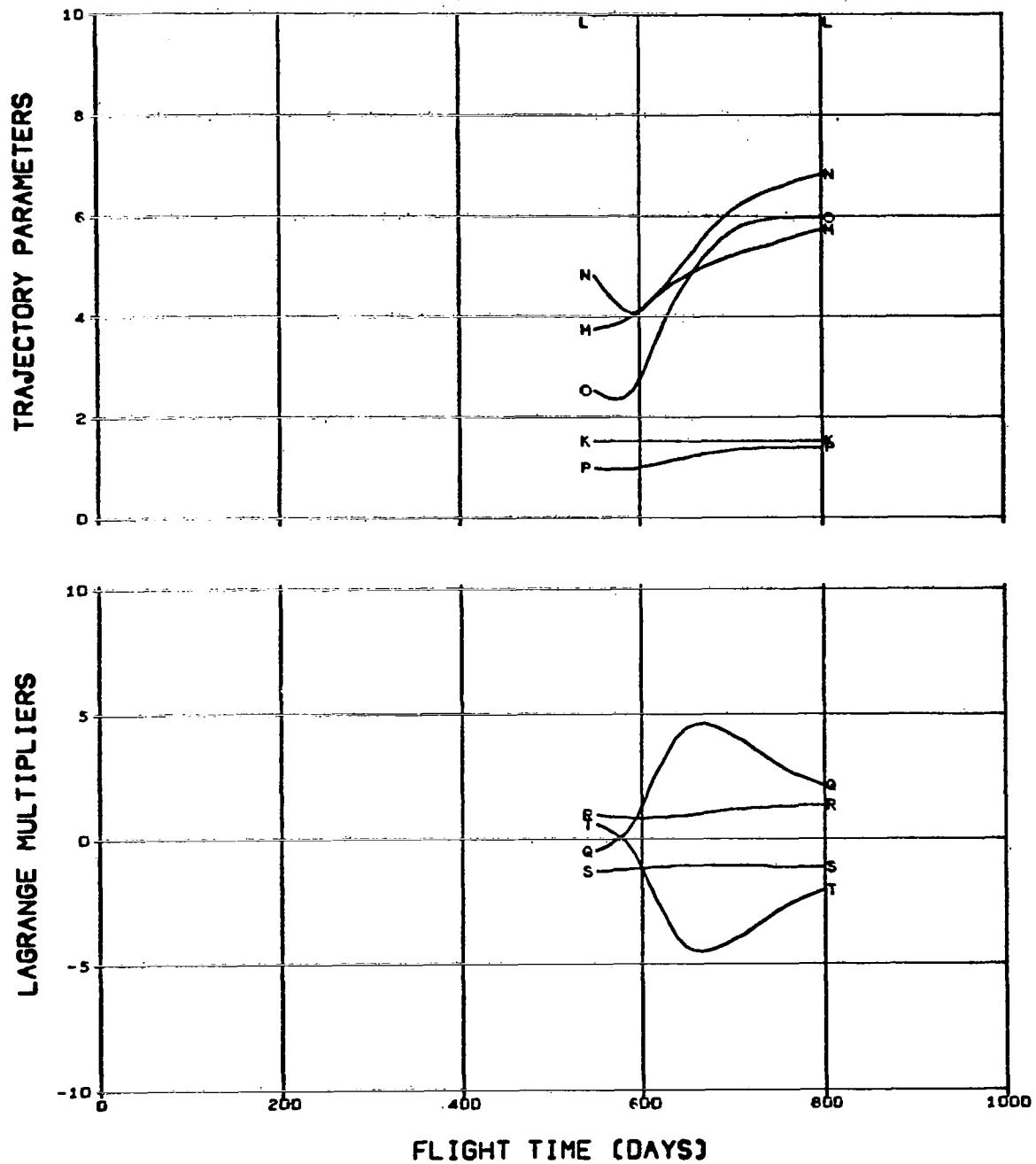
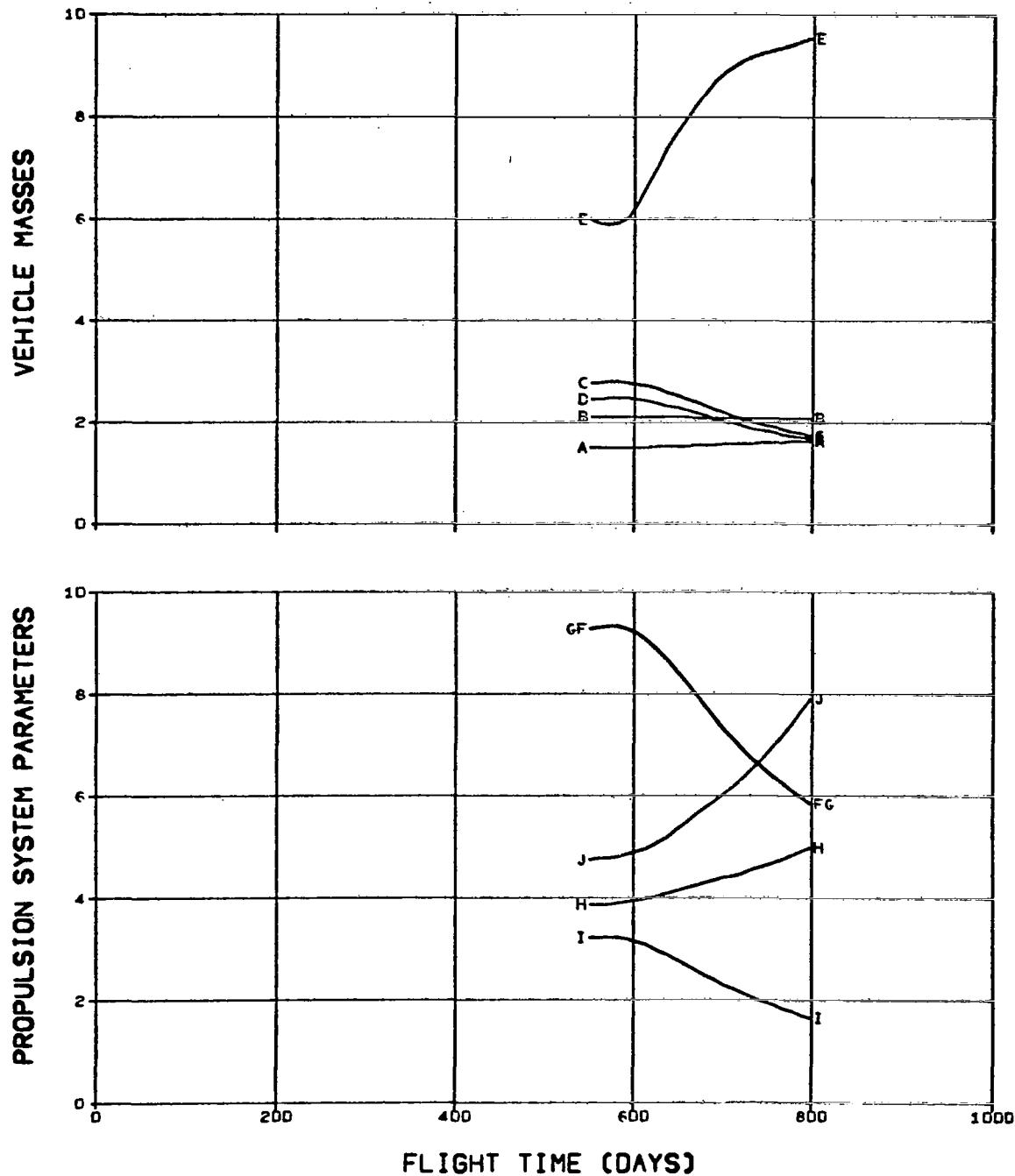


FIG. 3.5.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/10	J	PROPULSION TIME (DAYS)/100



**FIG. 3.5.5 MARS MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/100
 O ARRIVAL EXCESS SPEED (M/SEC)/100
 P RETRO INCREMENTAL SPEED (M/SEC)/100
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

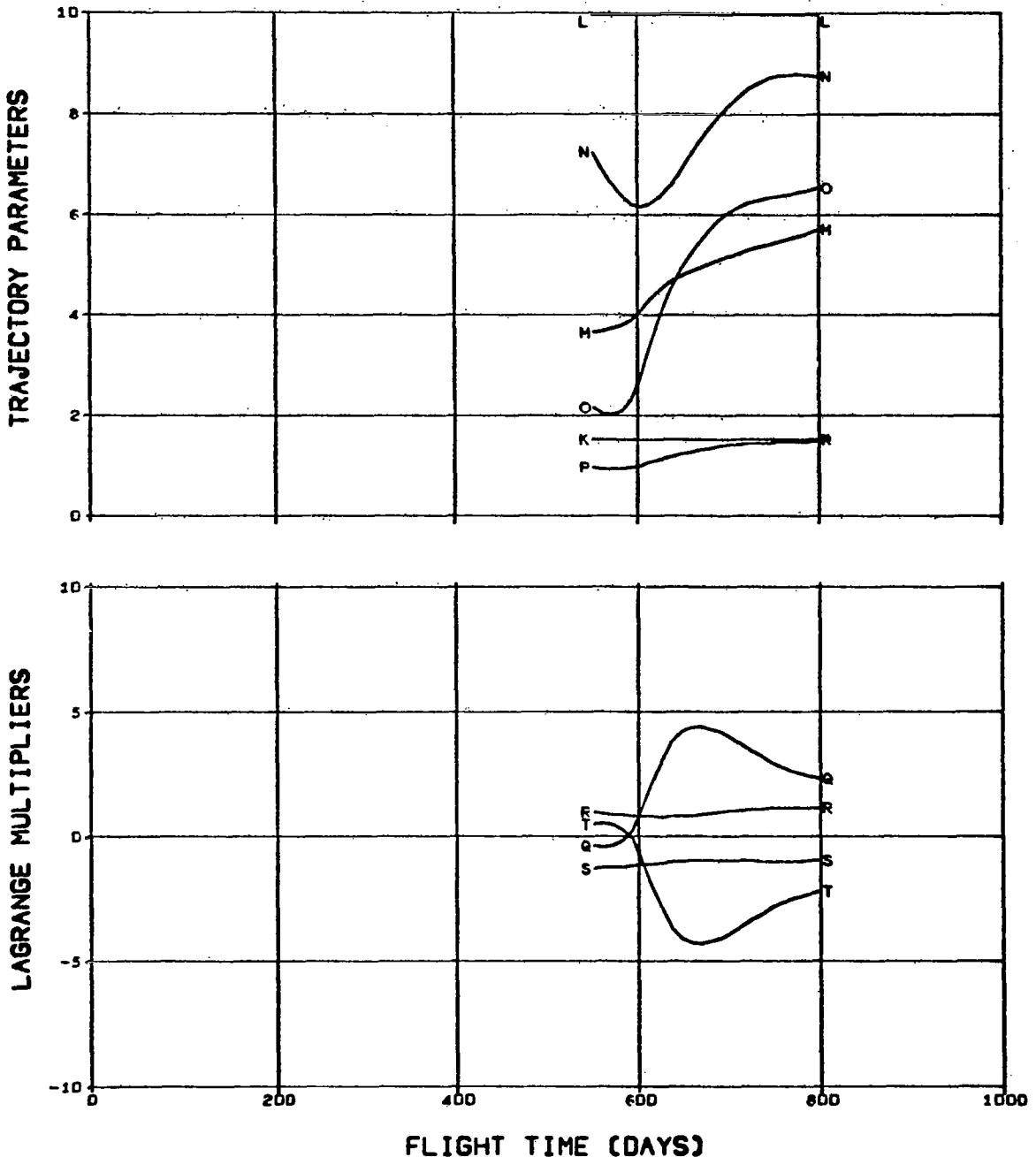
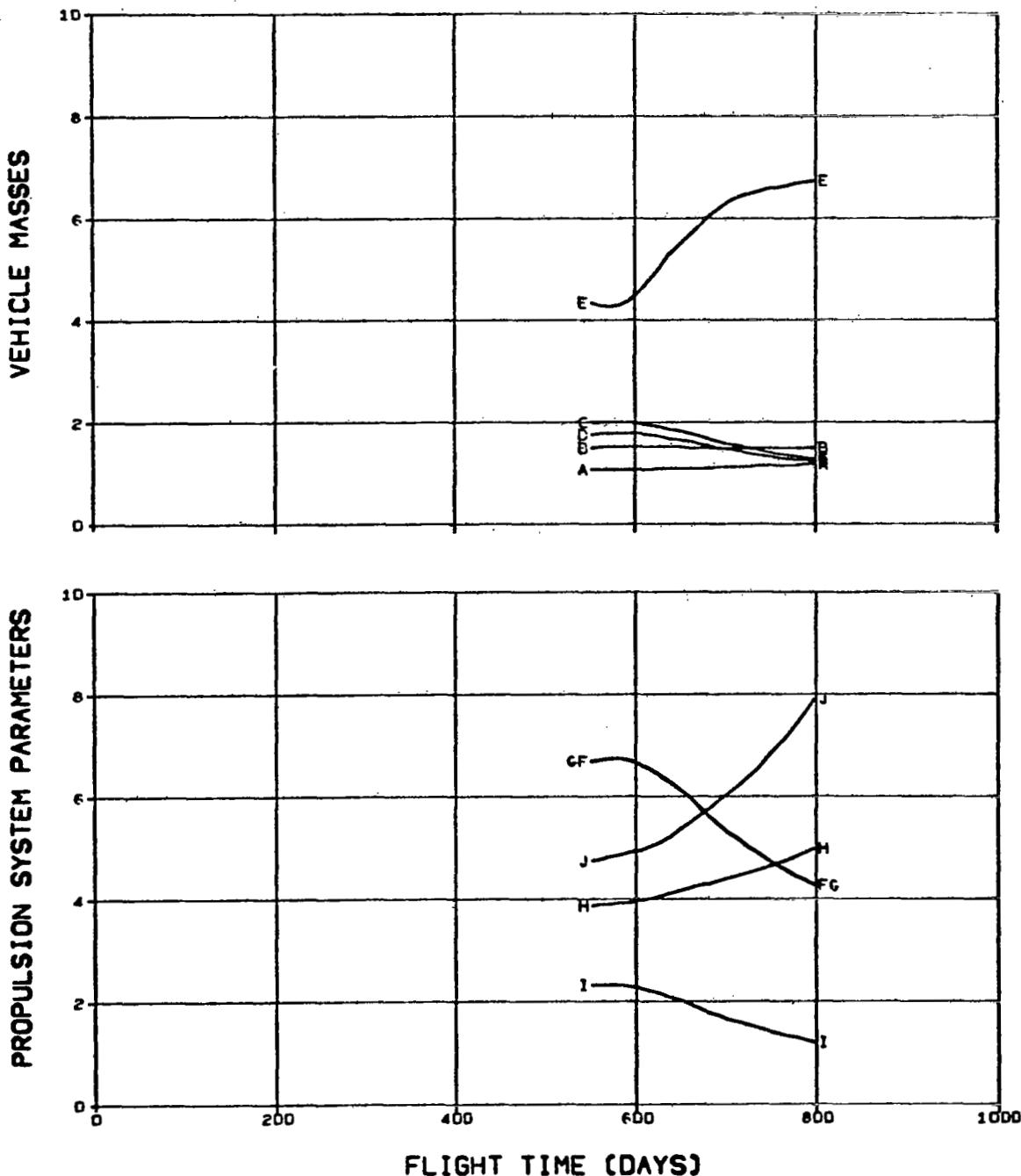


FIG. 3.5.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.0DE-1
E RETRO PROPELLANT MASS (KG)/10	J PROPULSION TIME (DAYS)/100



**FIG. 3.5.6 MARS MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/100
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/100 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

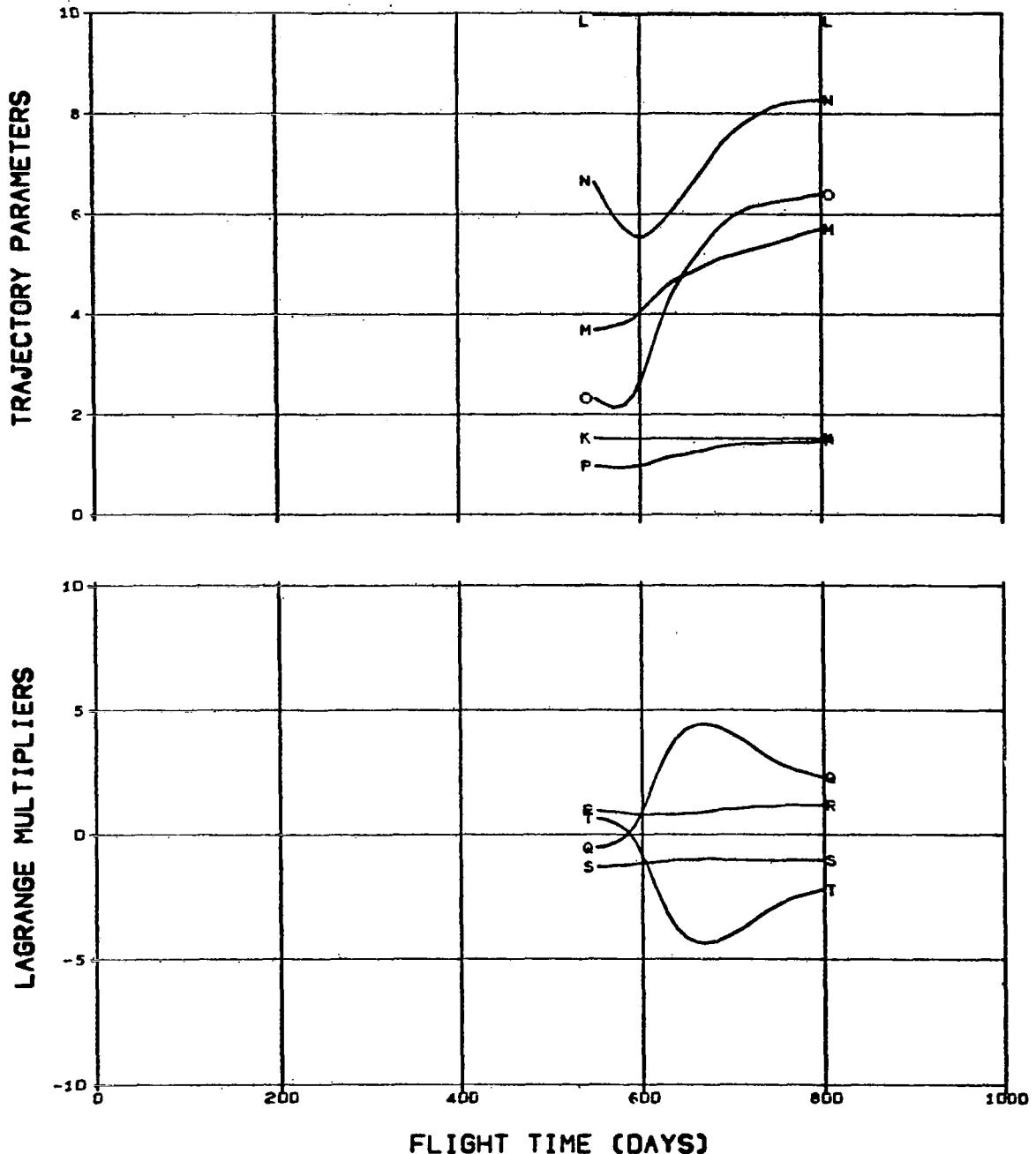


FIG. 3.5.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 2 AU (N)
		J	PROPULSION TIME (DAYS)/100

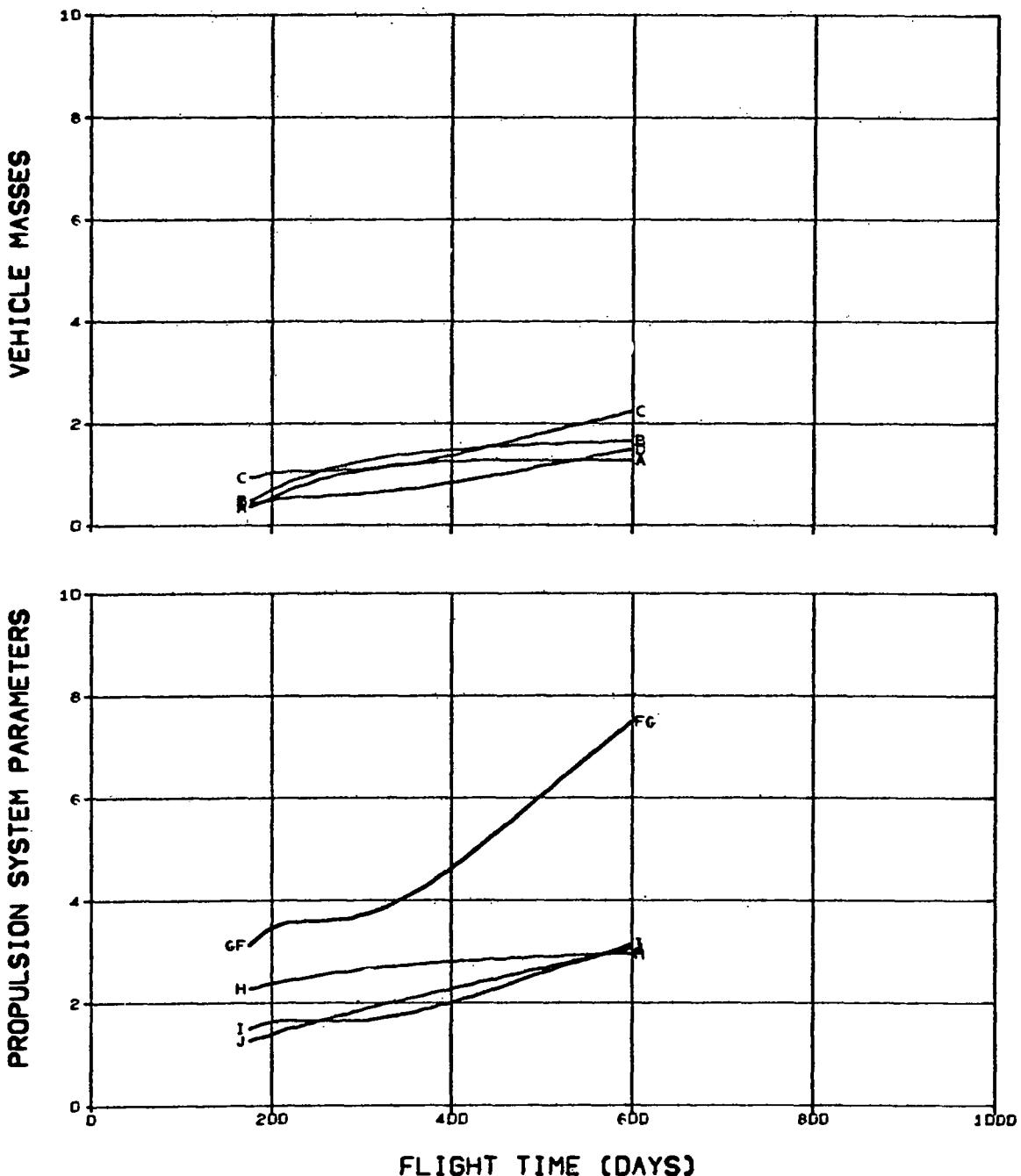


FIG. 4.1.1 CERES MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

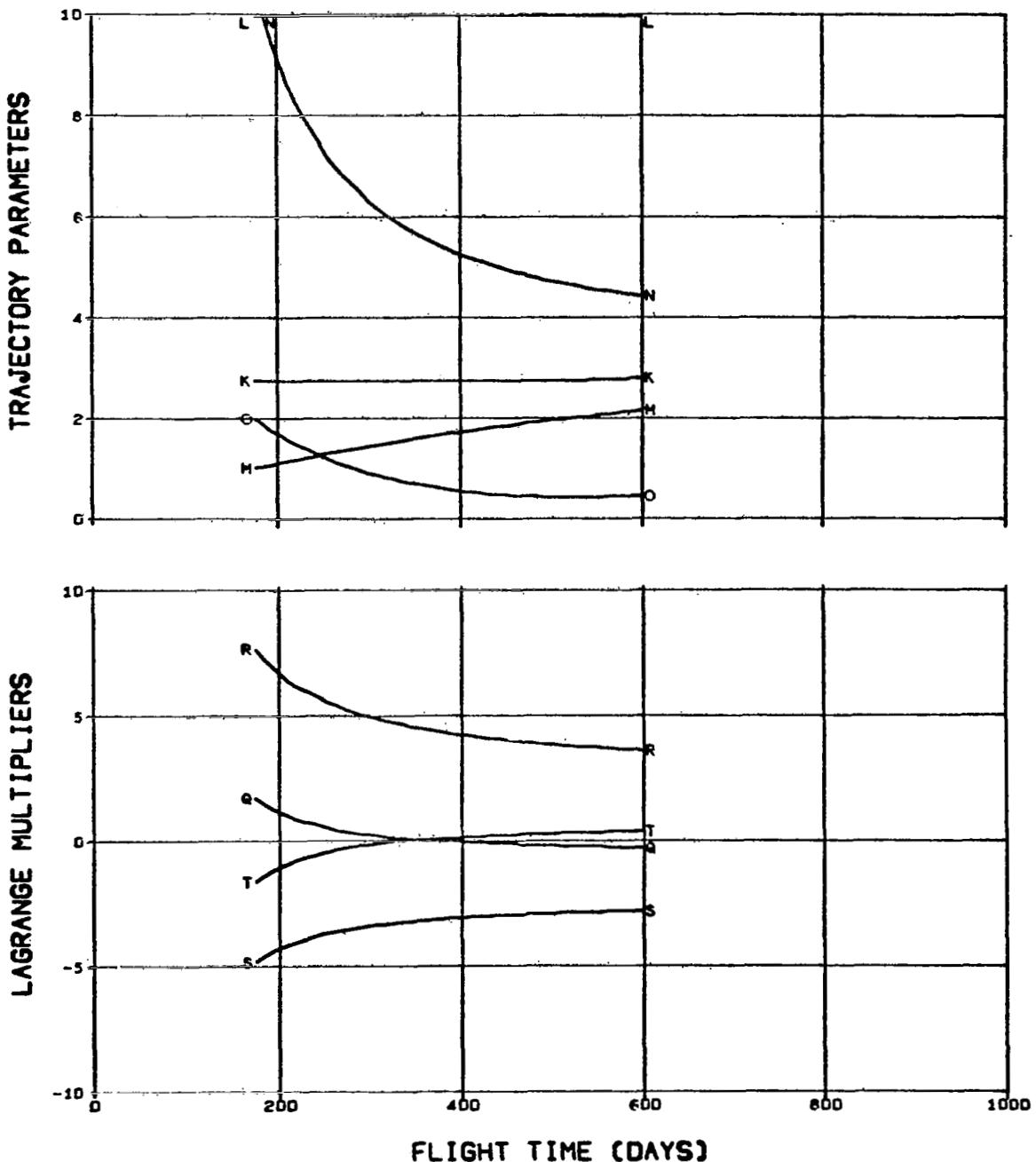


FIG. 4.1.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

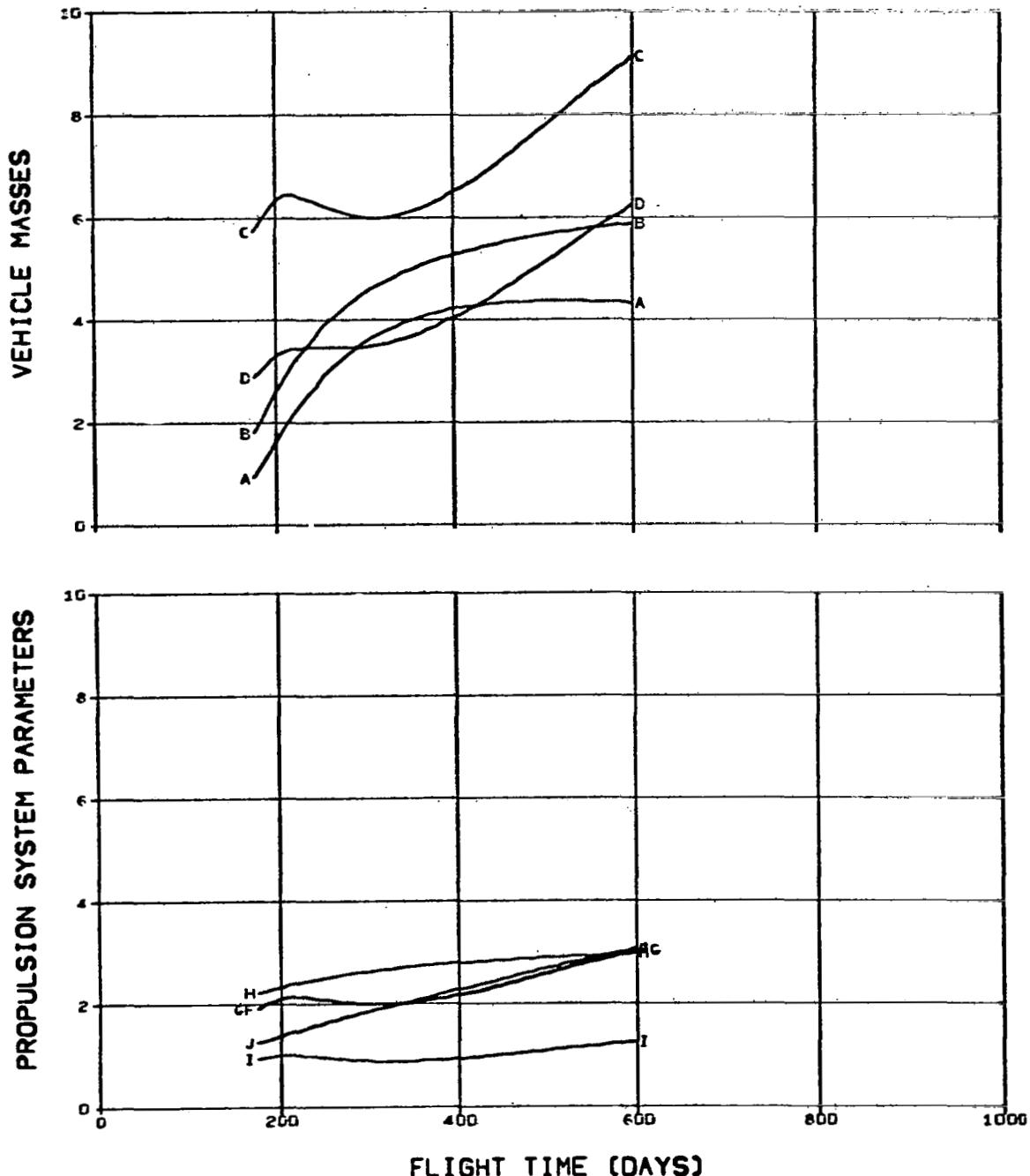


FIG. 4.1.2 CERES MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

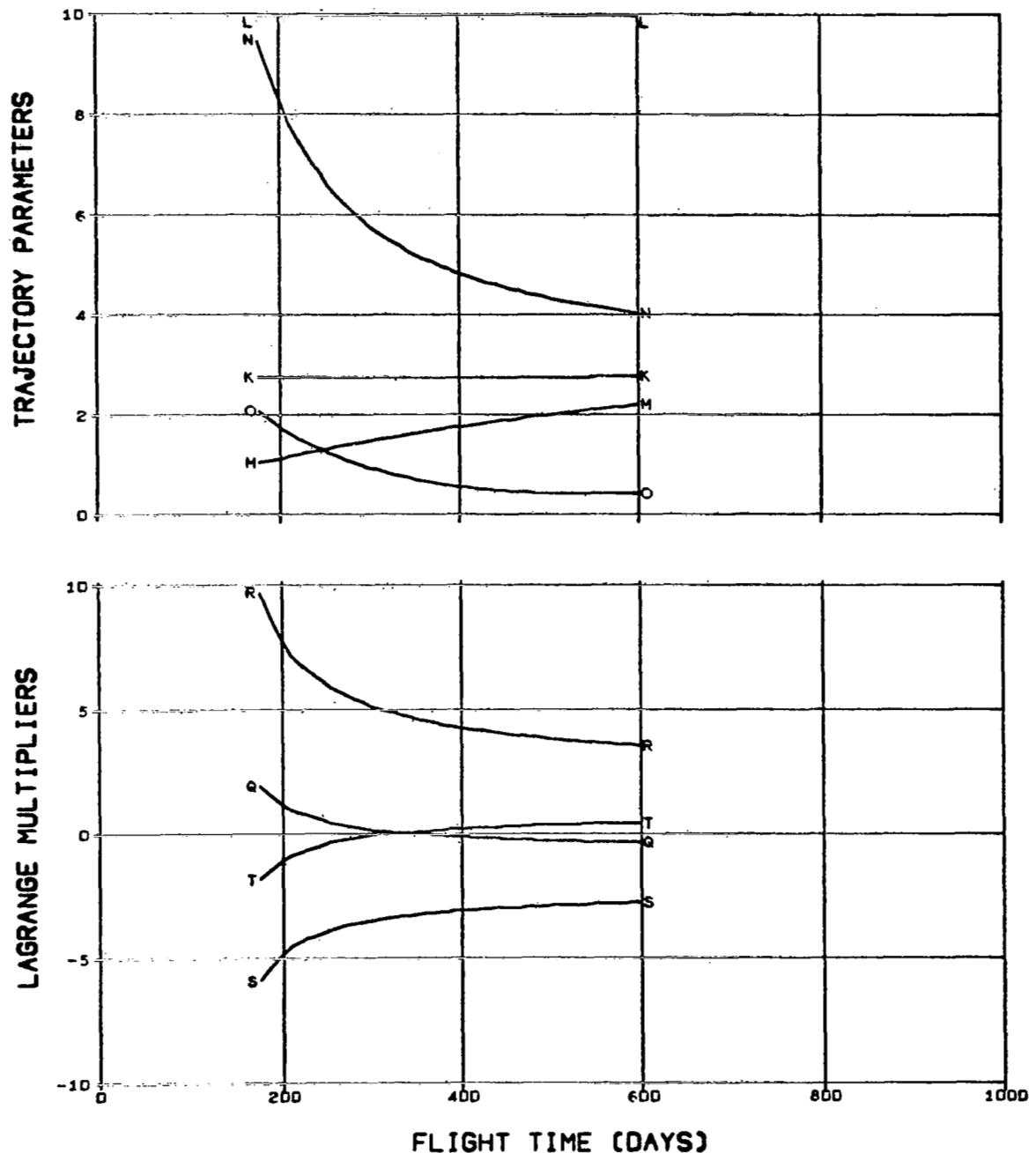


FIG. 4.1.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLSION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
		J	PROPELLION TIME (DAYS)/100

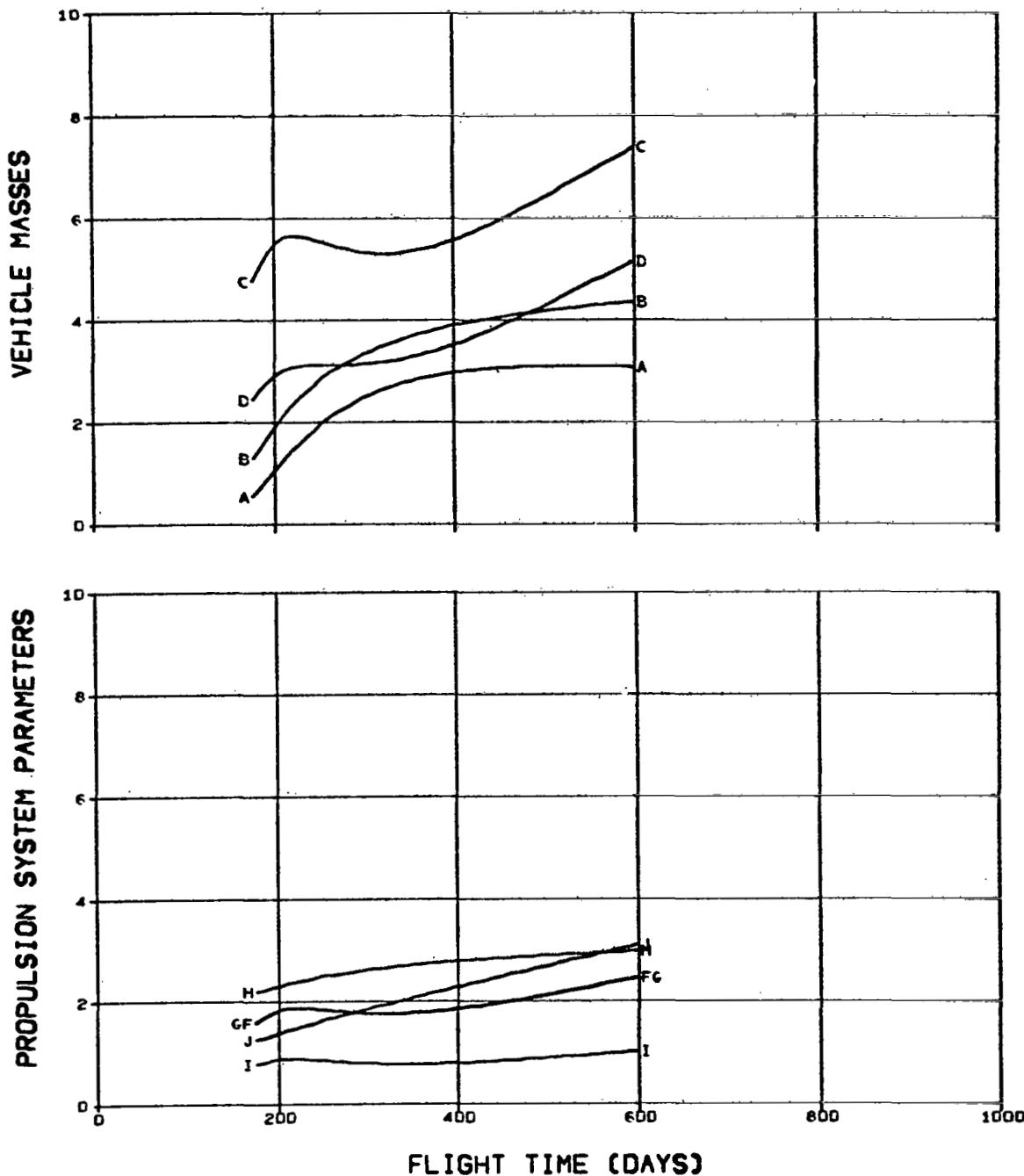


FIG. 4.1.3 CERES MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPARALLEL TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

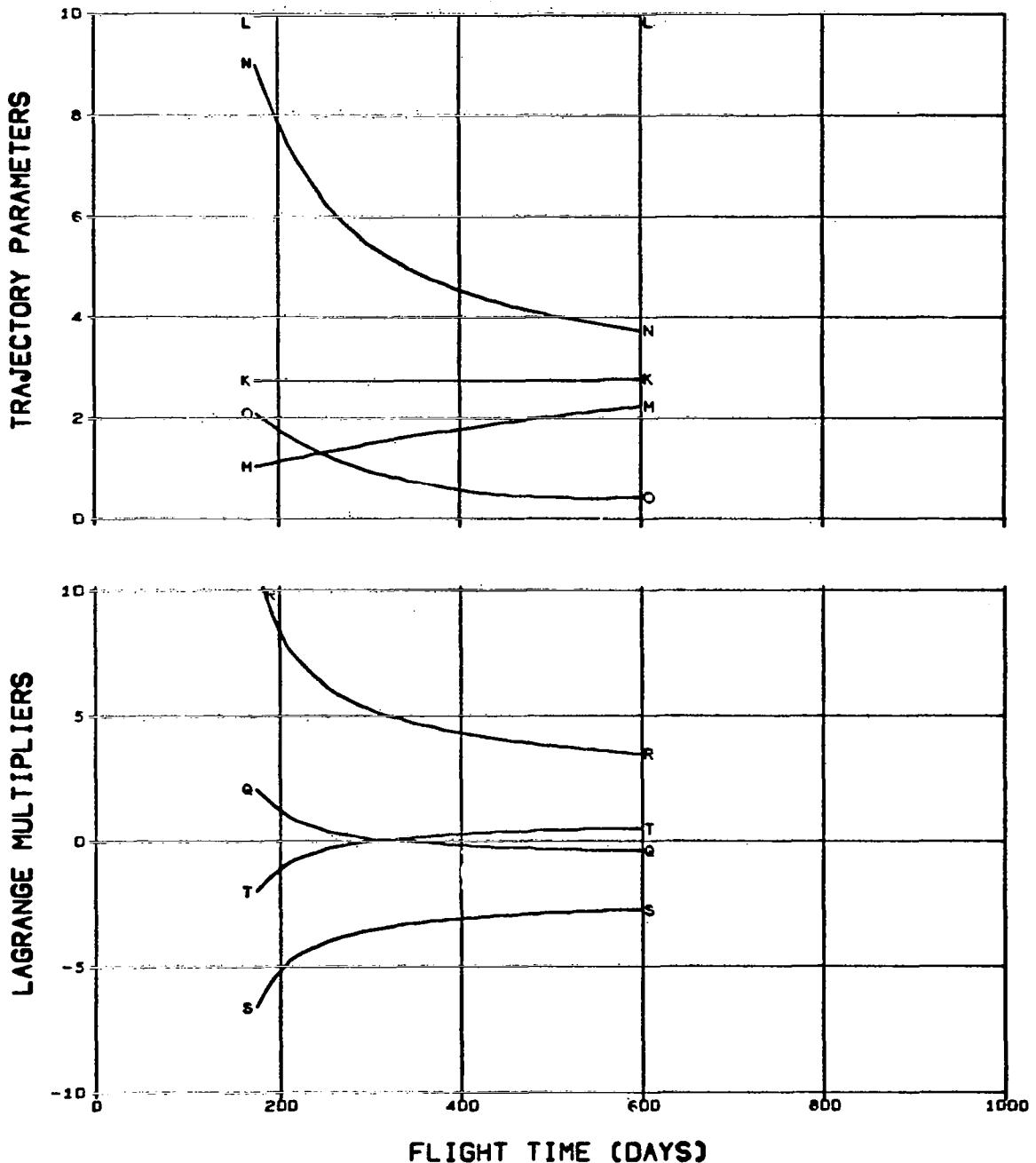


FIG. 4.1.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLUTION TIME (DAYS)/100

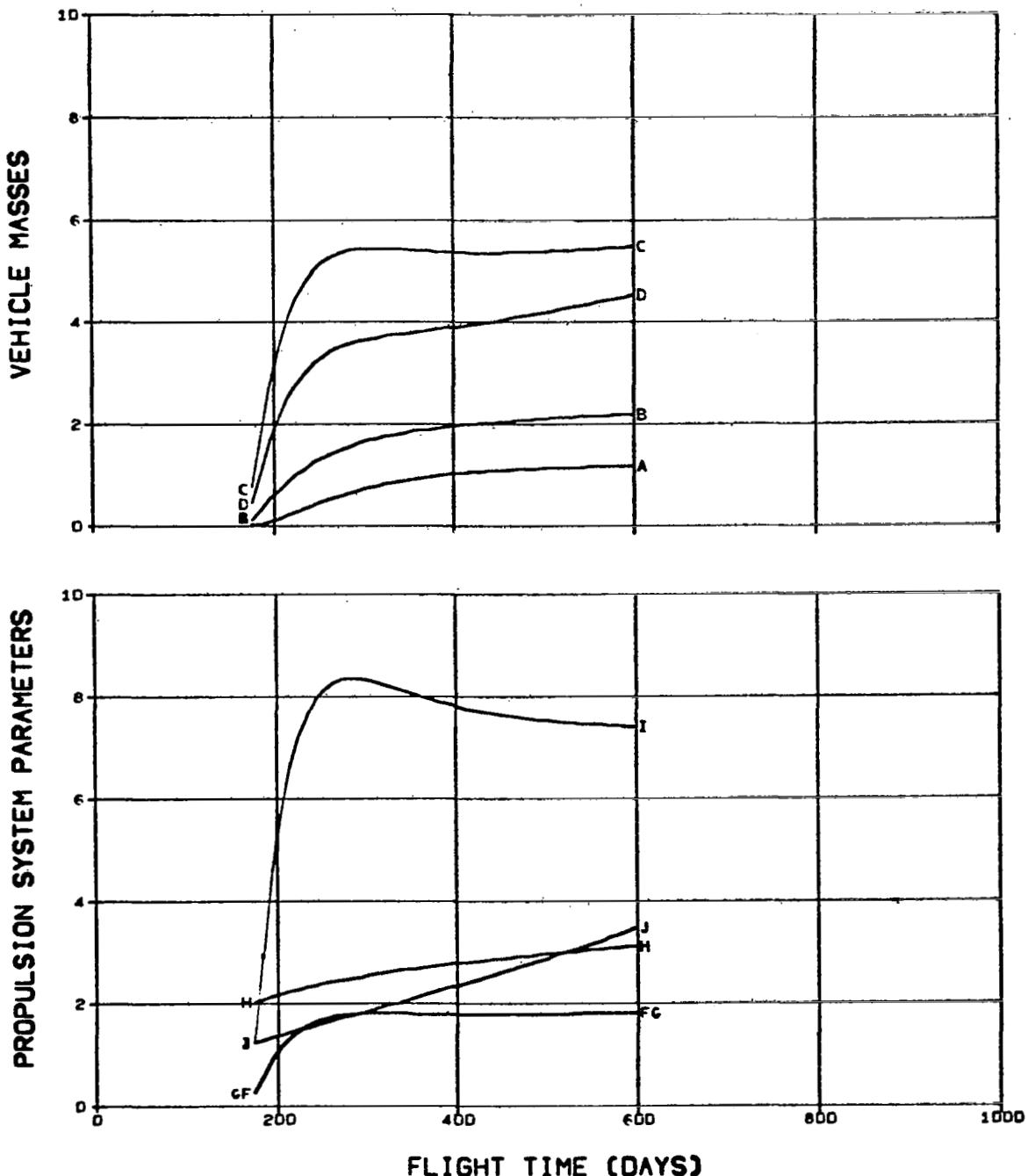


FIG. 4.1.4 CERES MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

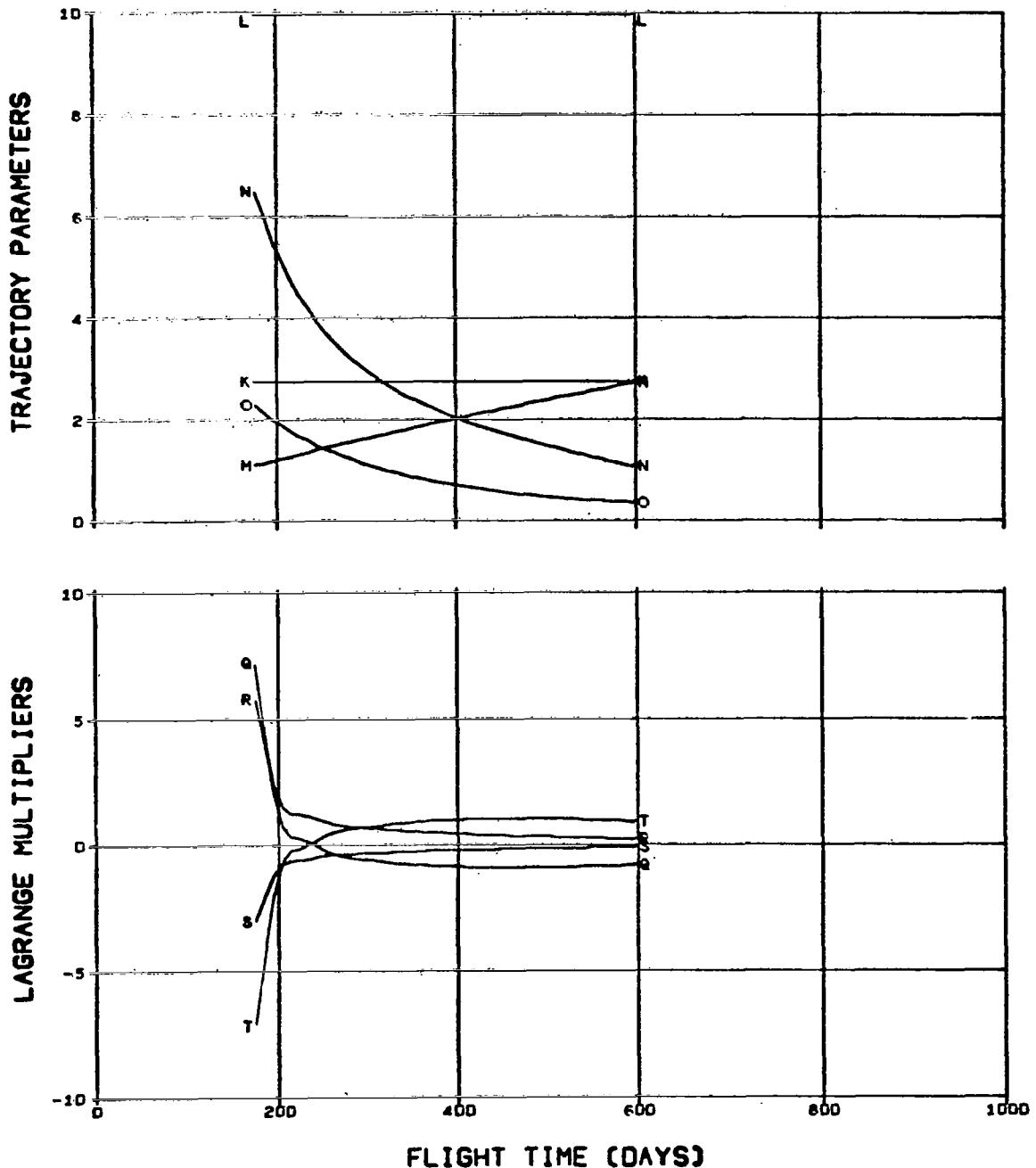


FIG. 4.1.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPULSION TIME (DAYS)/100

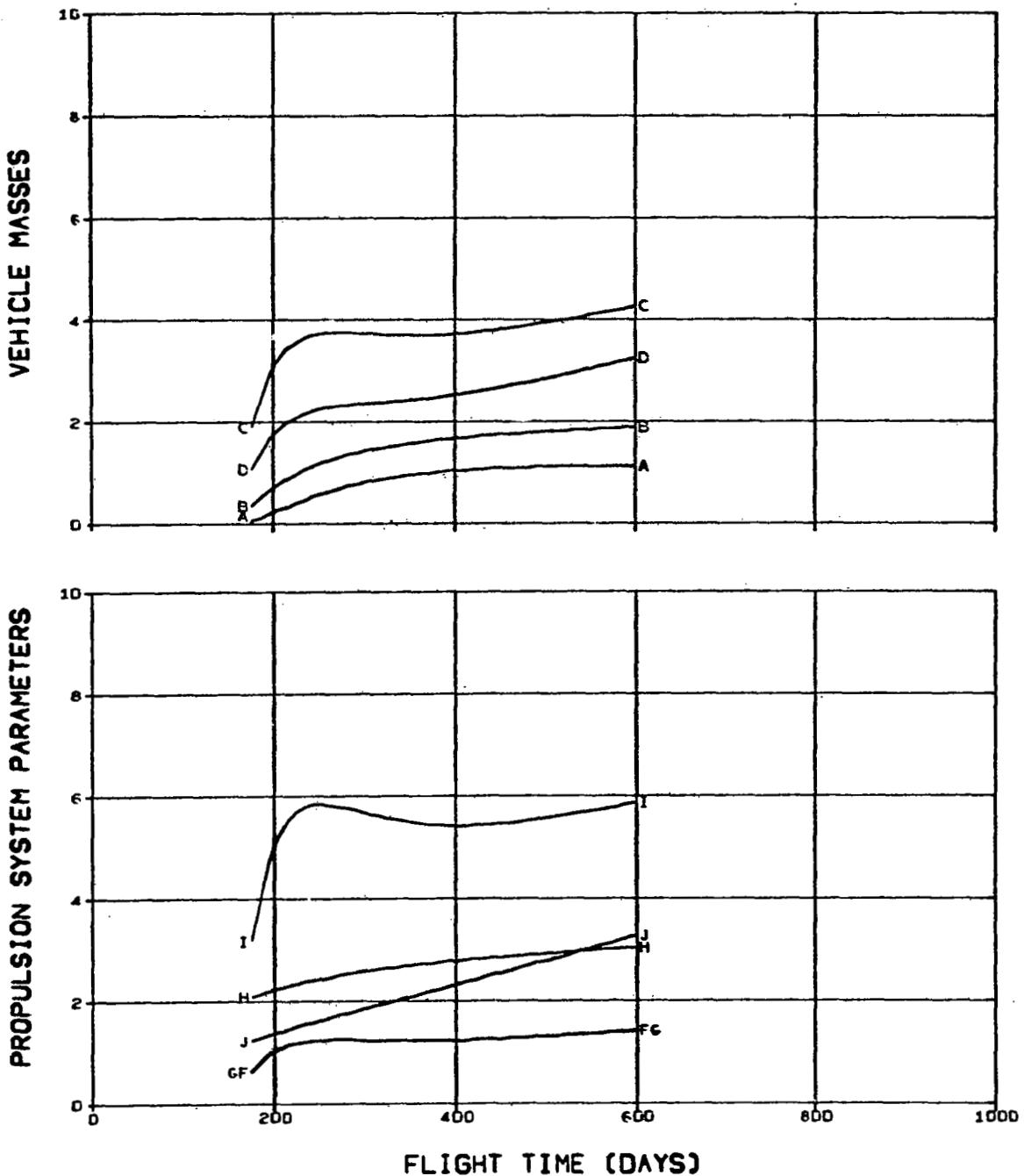


FIG. 4.1.5 CERES MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

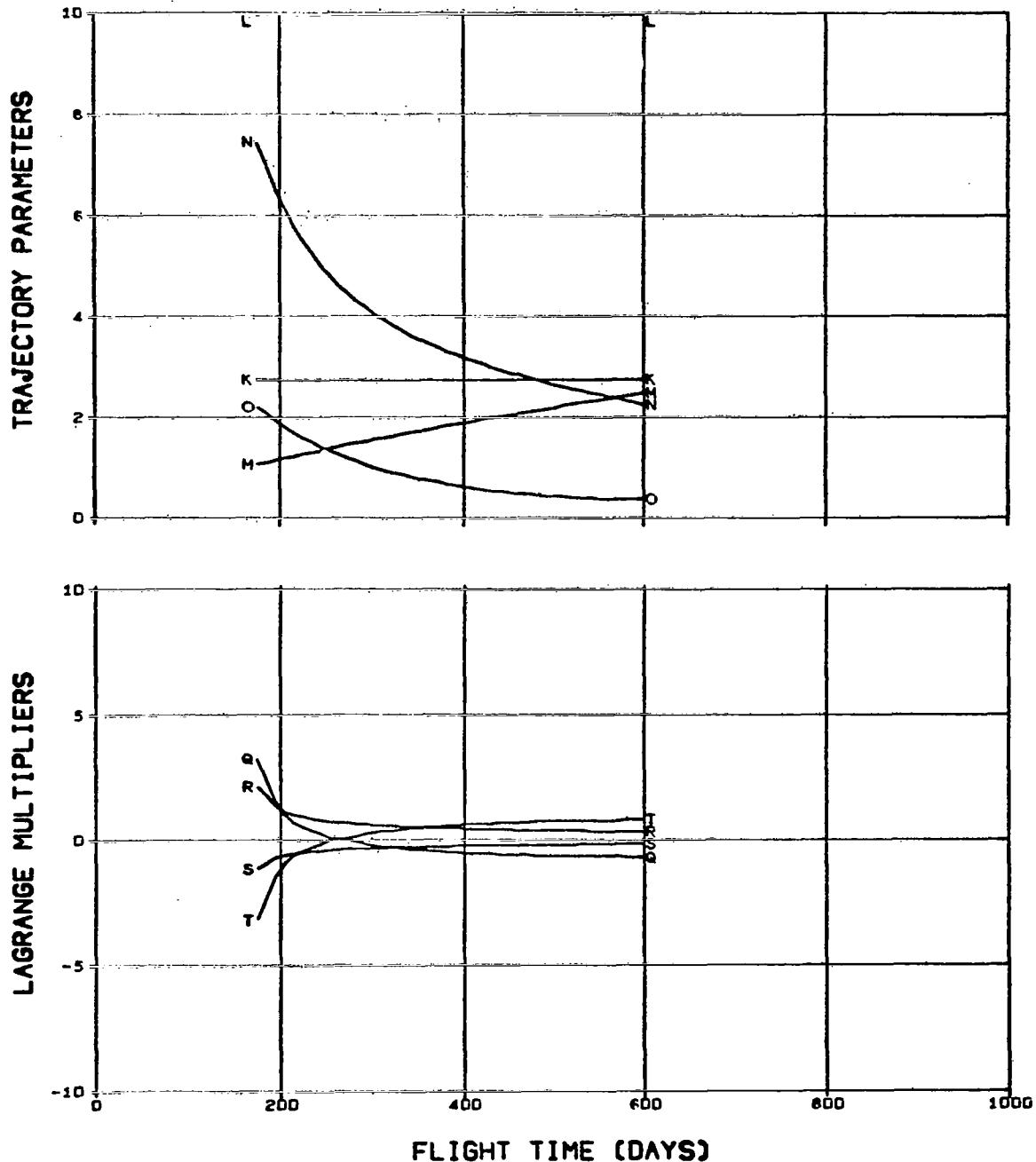


FIG. 4.1.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPULSION TIME (DAYS)/100

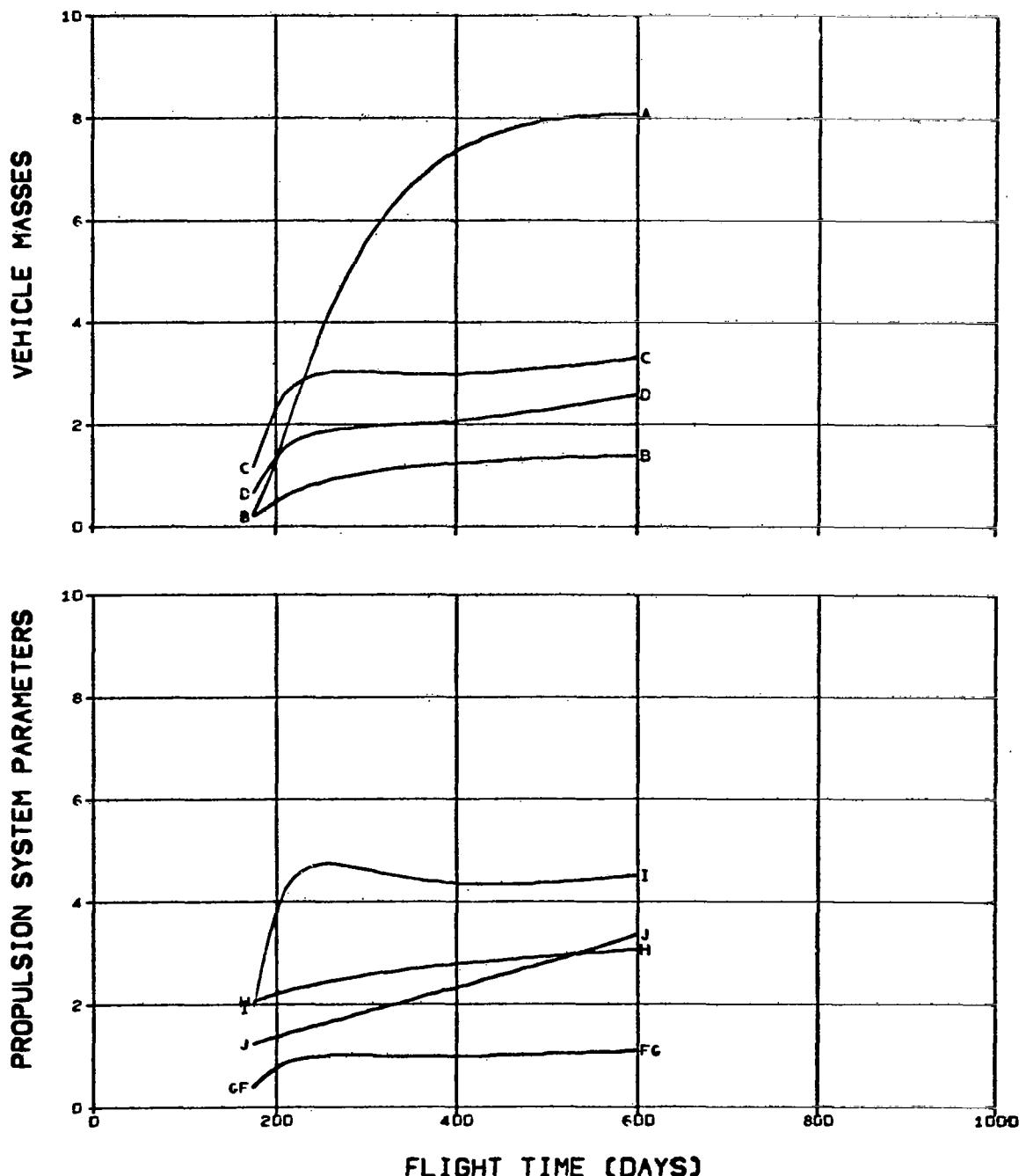


FIG. 4.1.6 CERES MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K . MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L . MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER/10
 M . HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N . LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O . ARRIVAL EXCESS SPEED (M/SEC)/10000

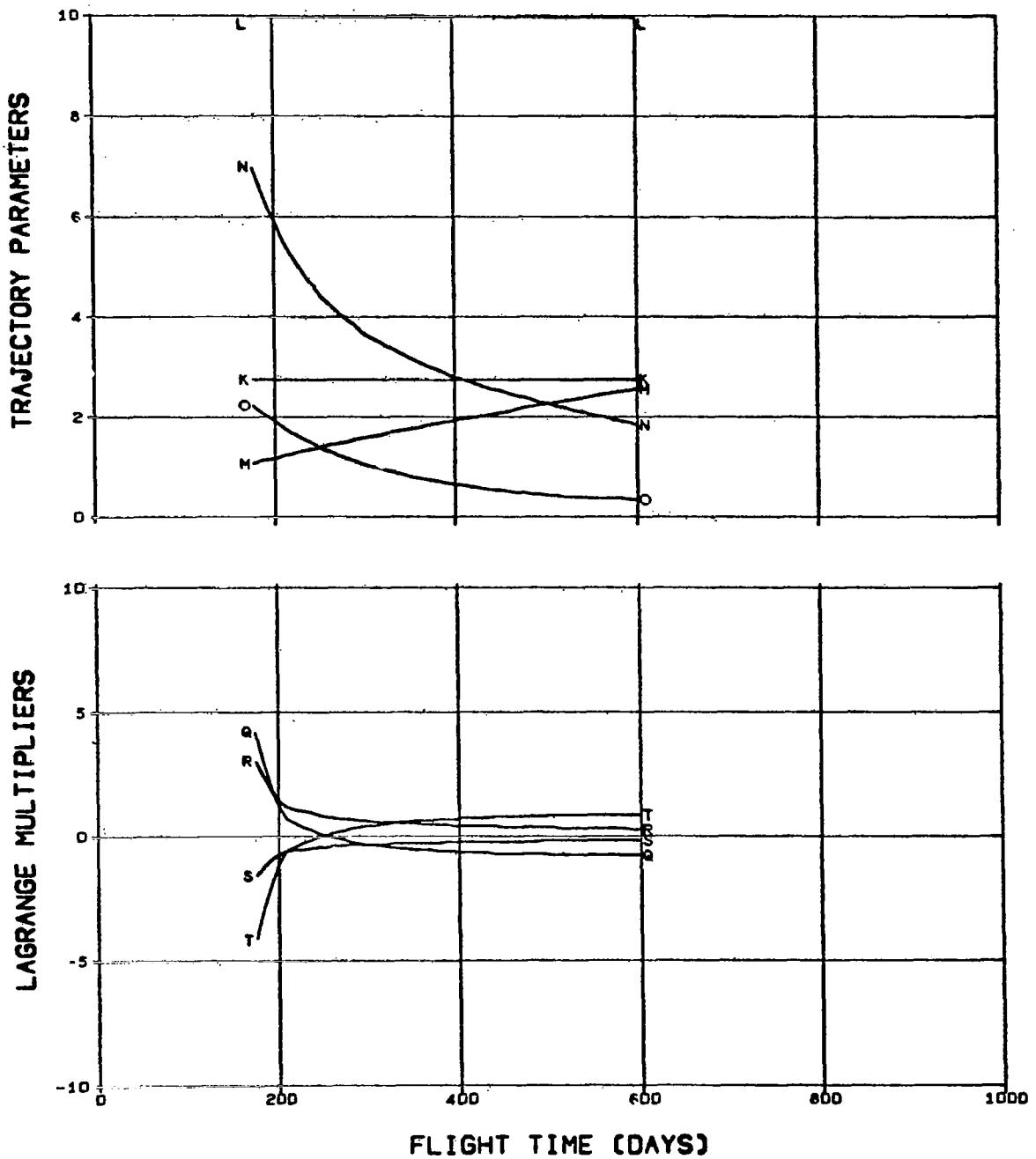


FIG. 4.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROFULSION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROFULSION TIME (DAYS)/100

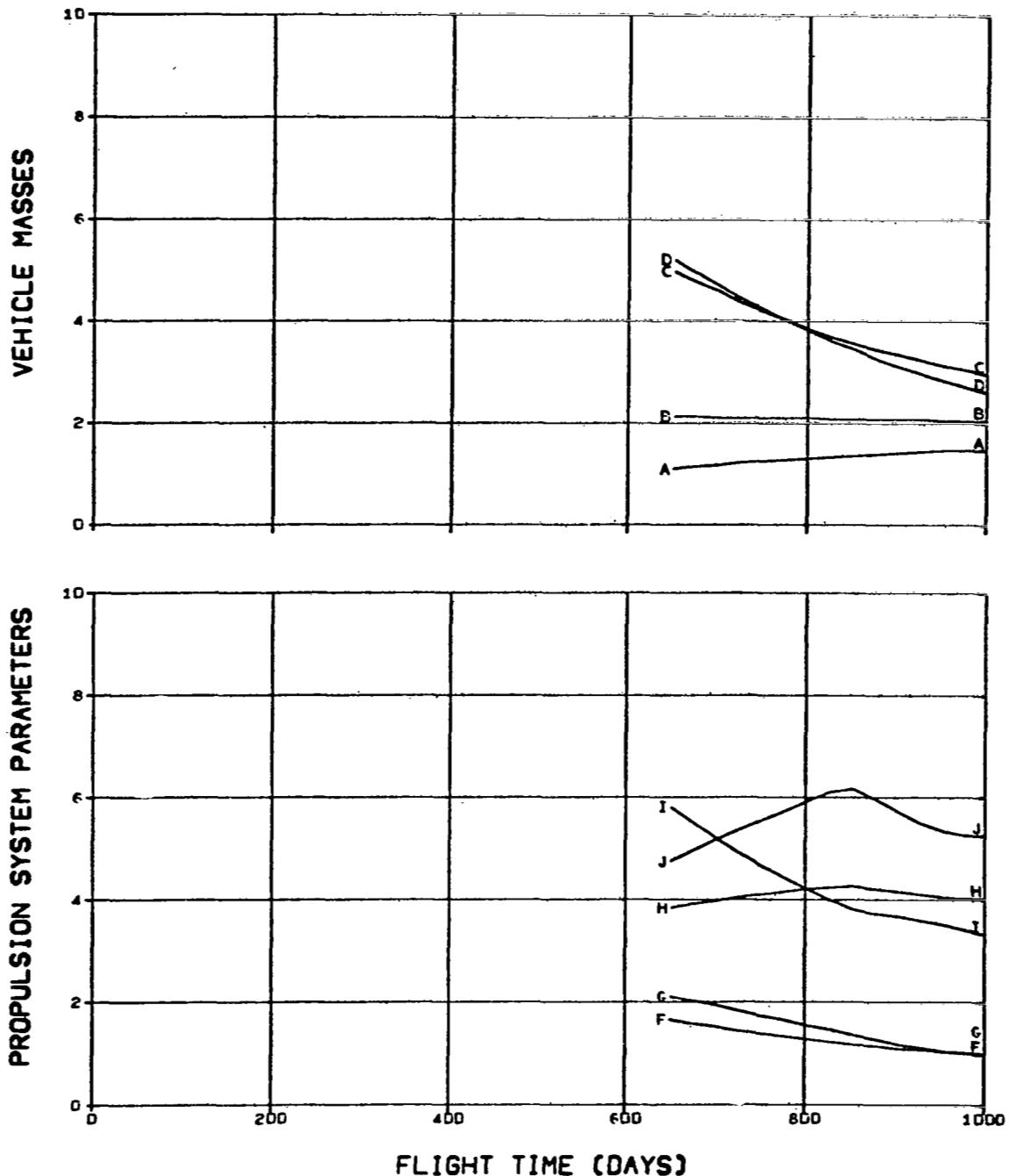


FIG. 4.2.1 CERES MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	O	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

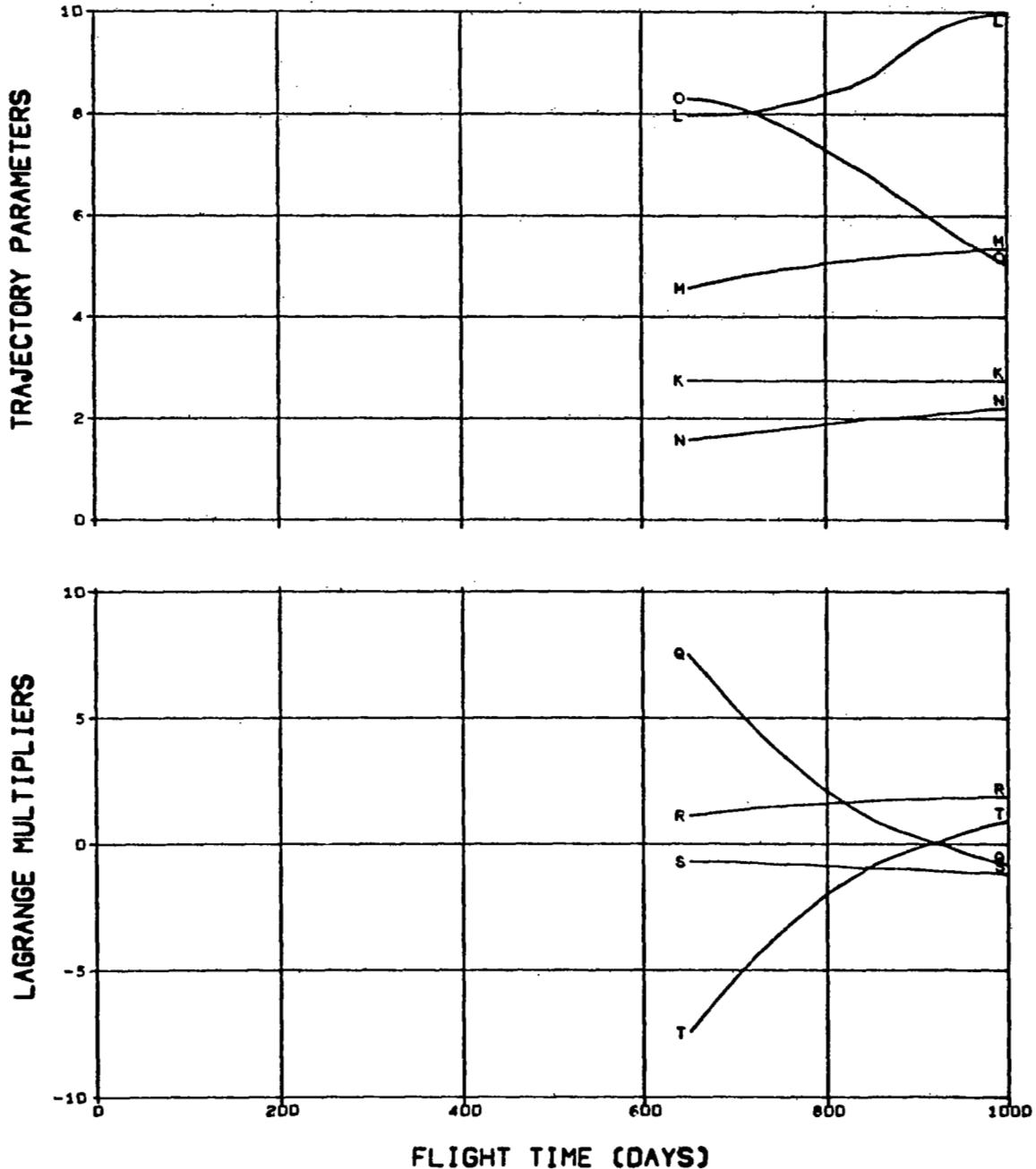


FIG. 4.2.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/1000

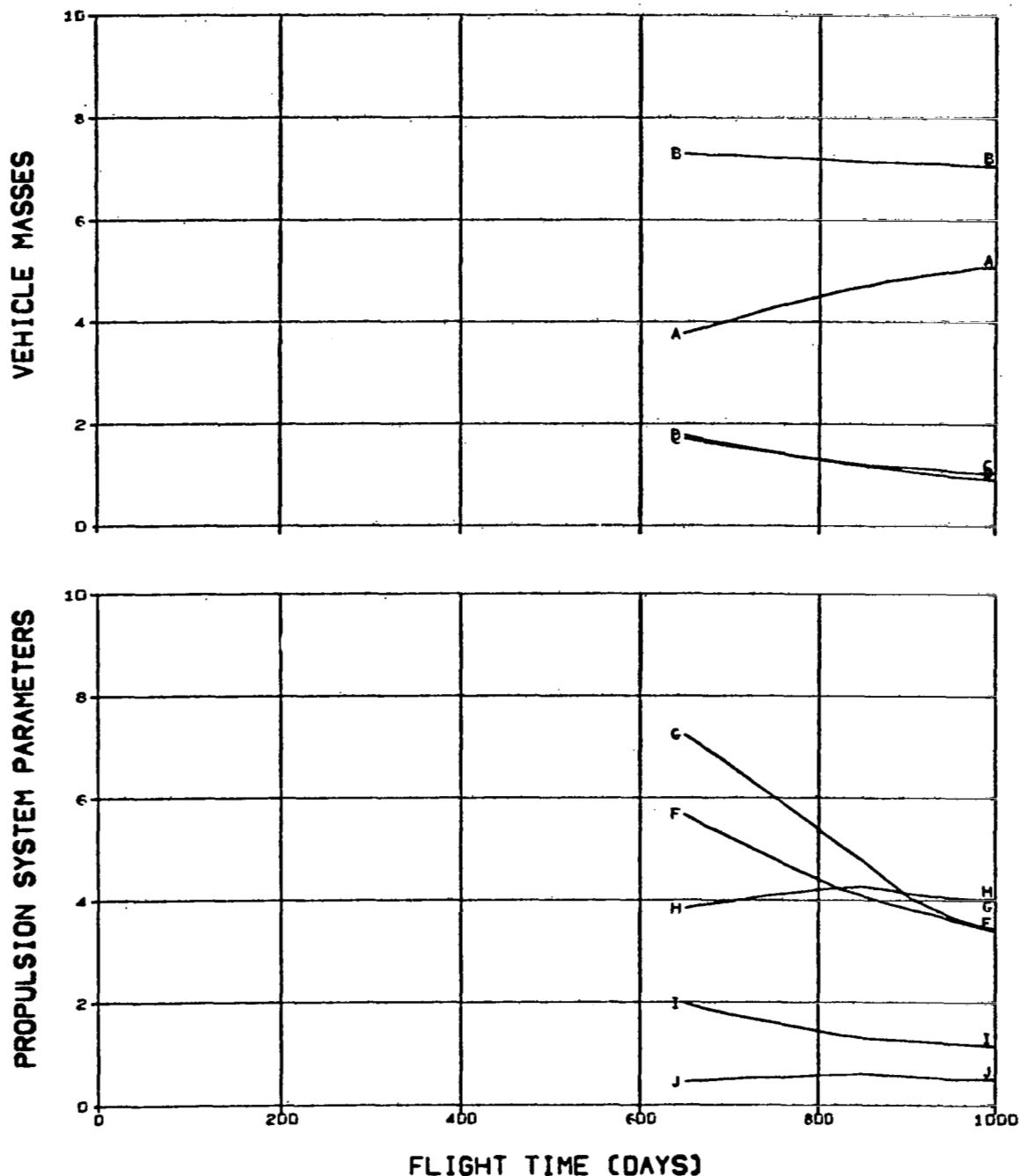


FIG. 4.2.2 CERES MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.00E-1
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

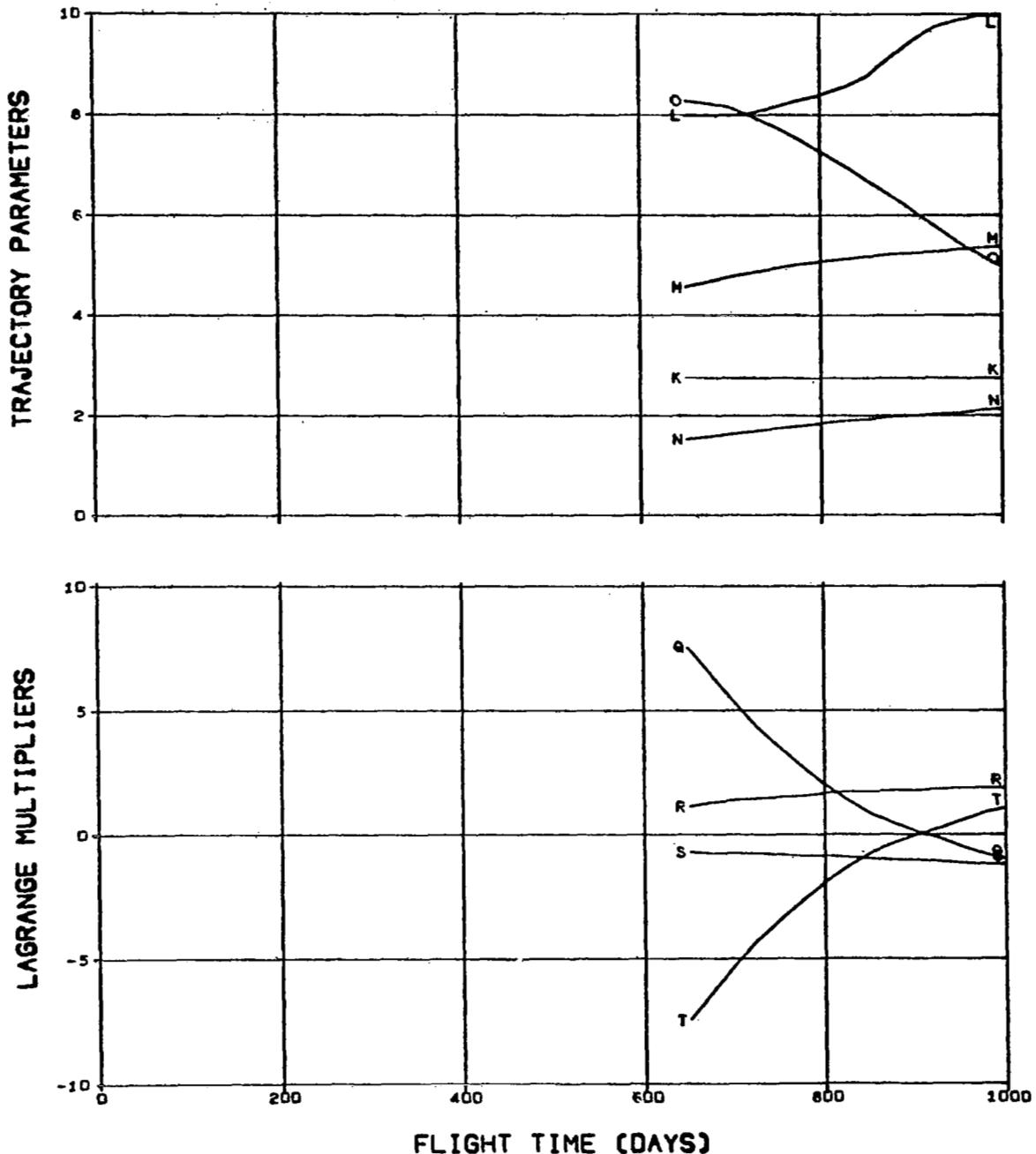


FIG. 4.2.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/100

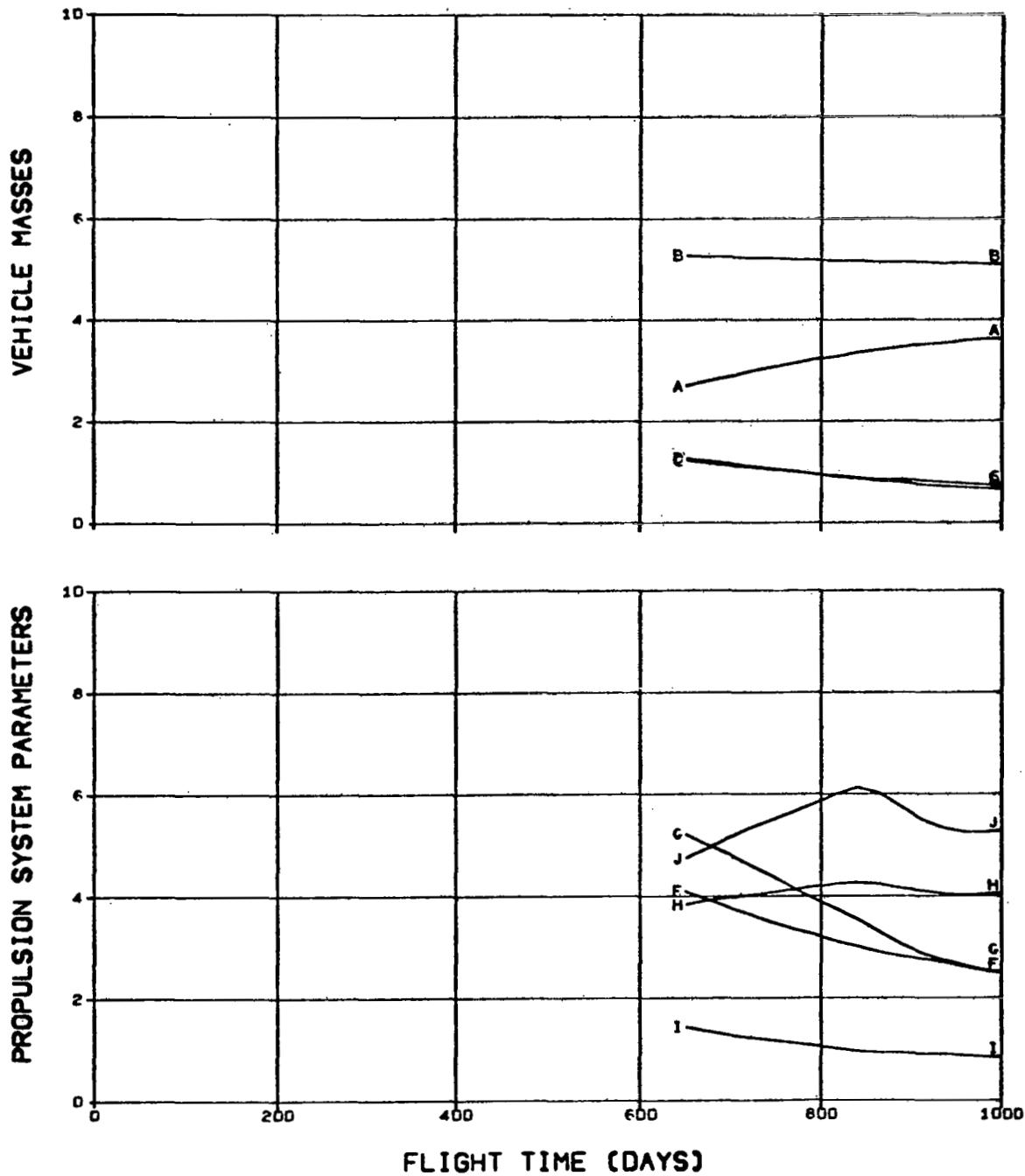


FIG. 4.2.3 CERES MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

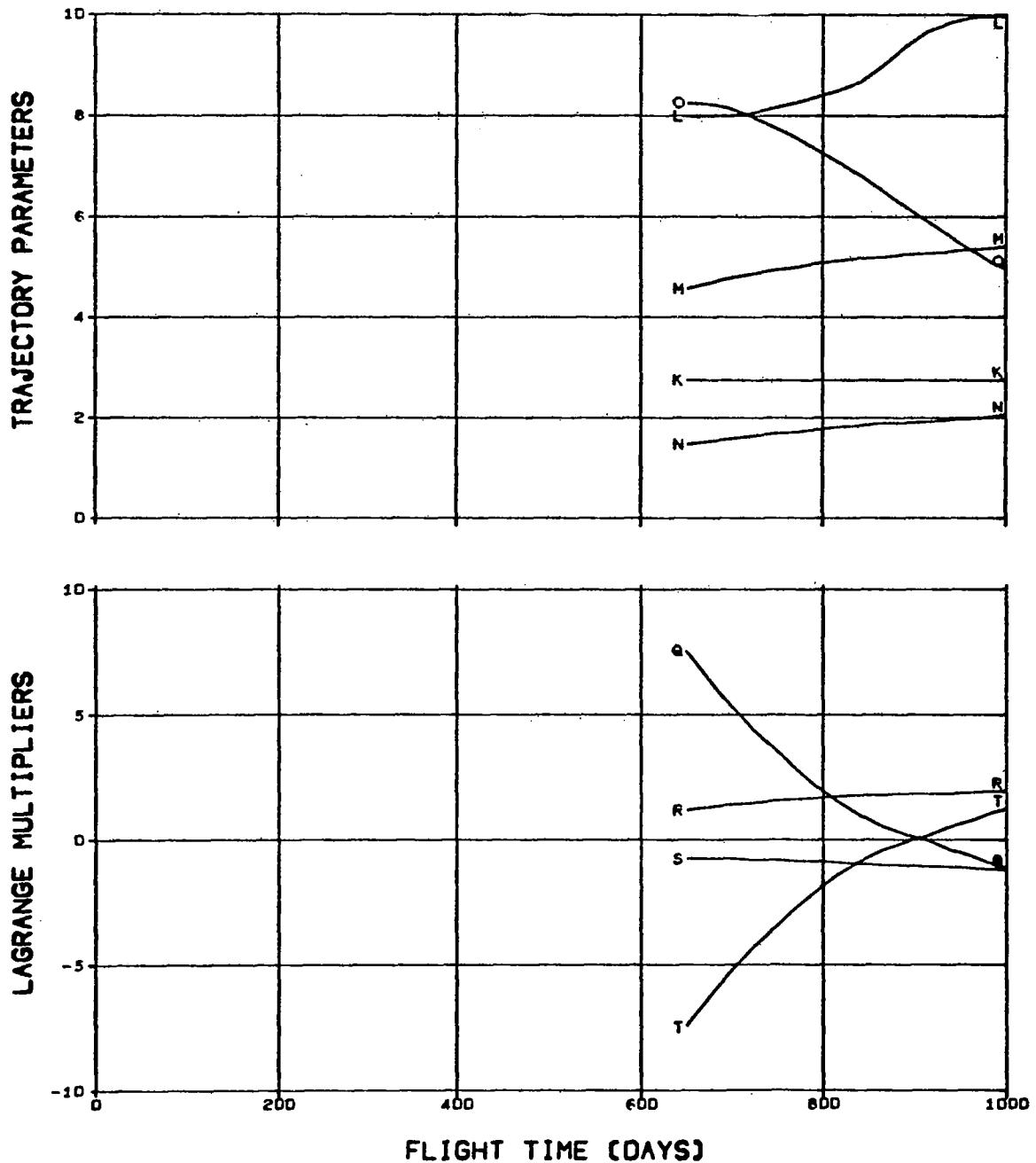


FIG. 4.2.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPULSION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLUTION TIME (DAYS)/100

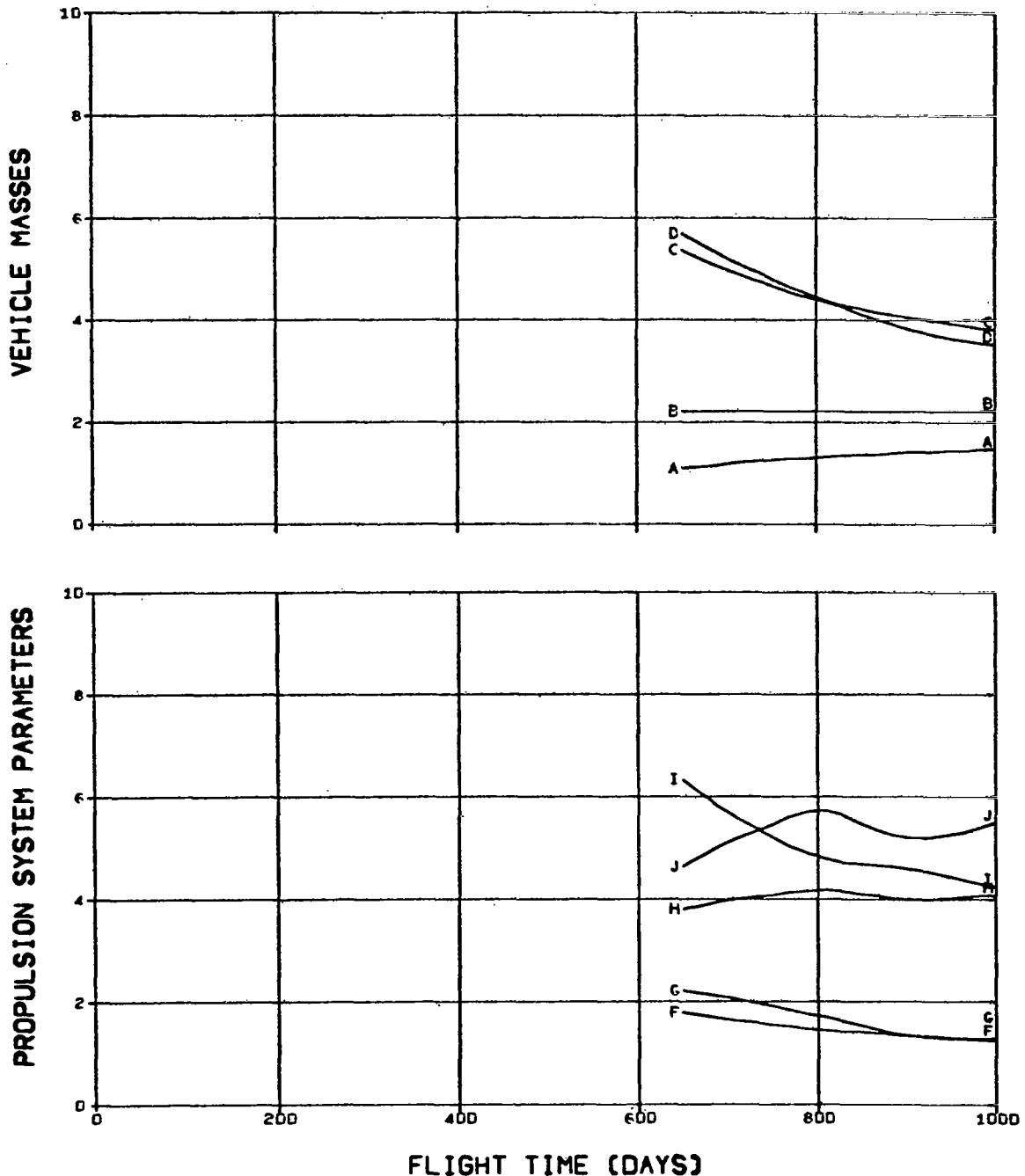


FIG. 4.2.4 CERES MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/100 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

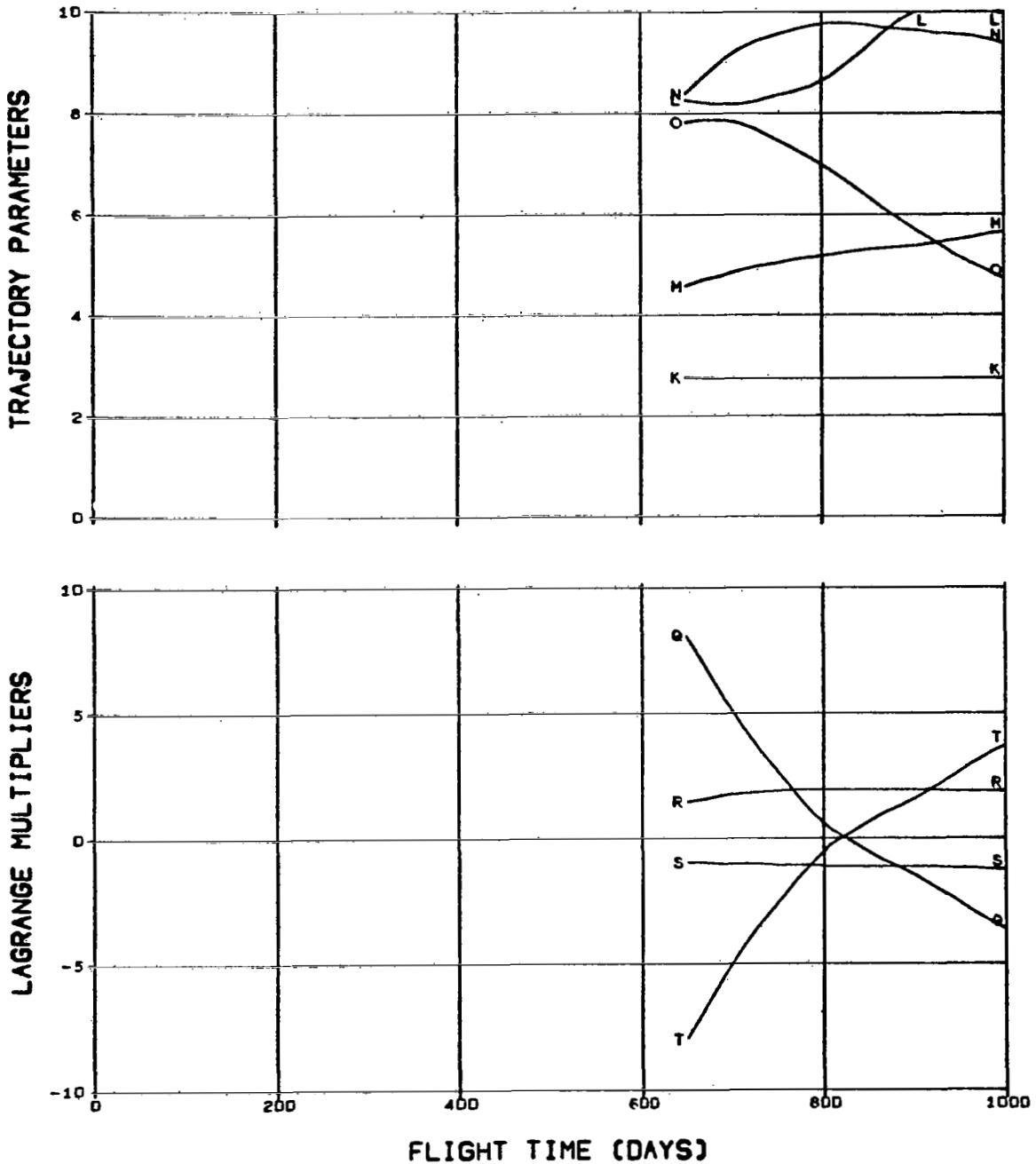


FIG. 4.2.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLENT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPULSION TIME (DAYS)/100

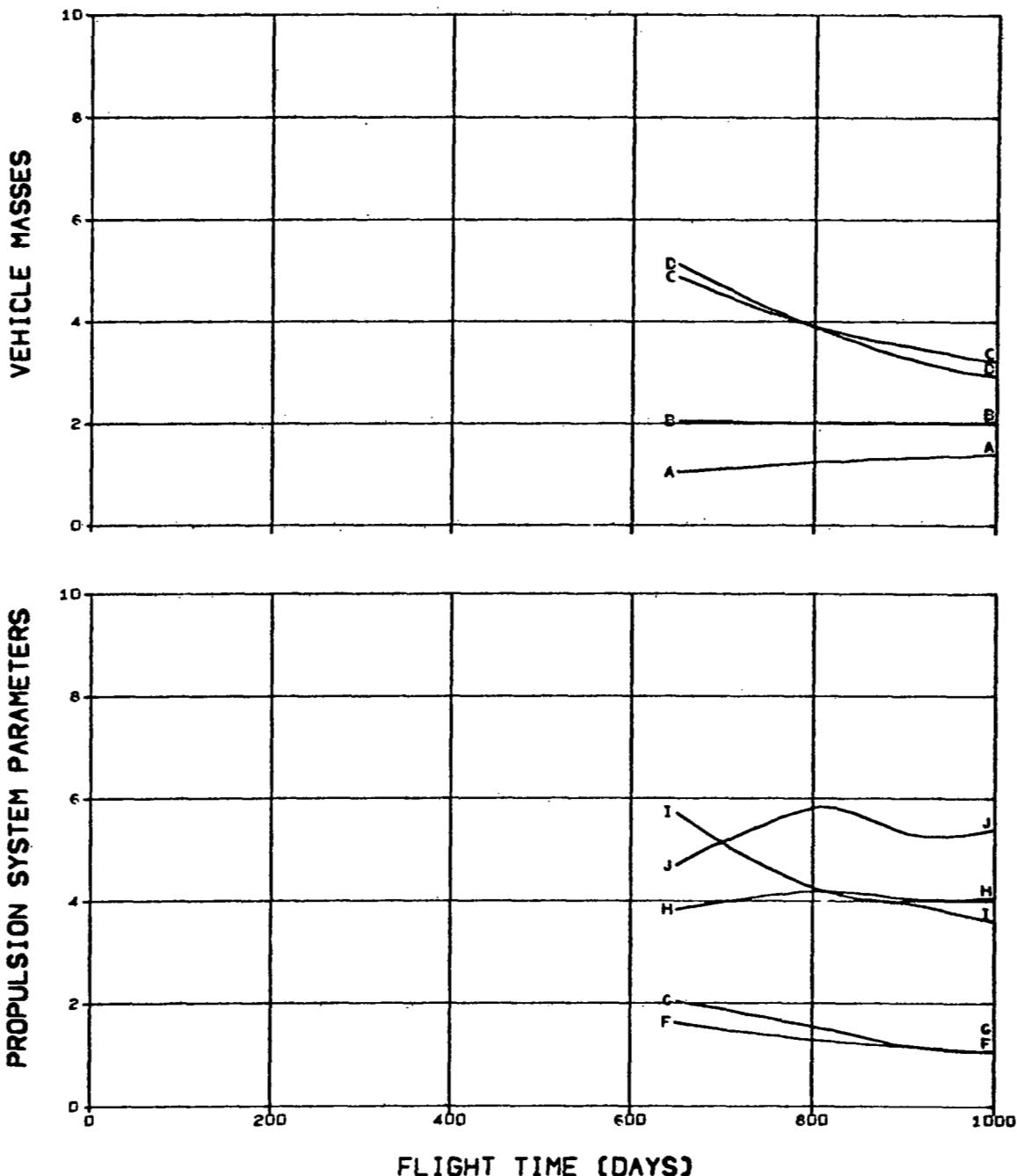


FIG. 4.2.5 CERES MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		

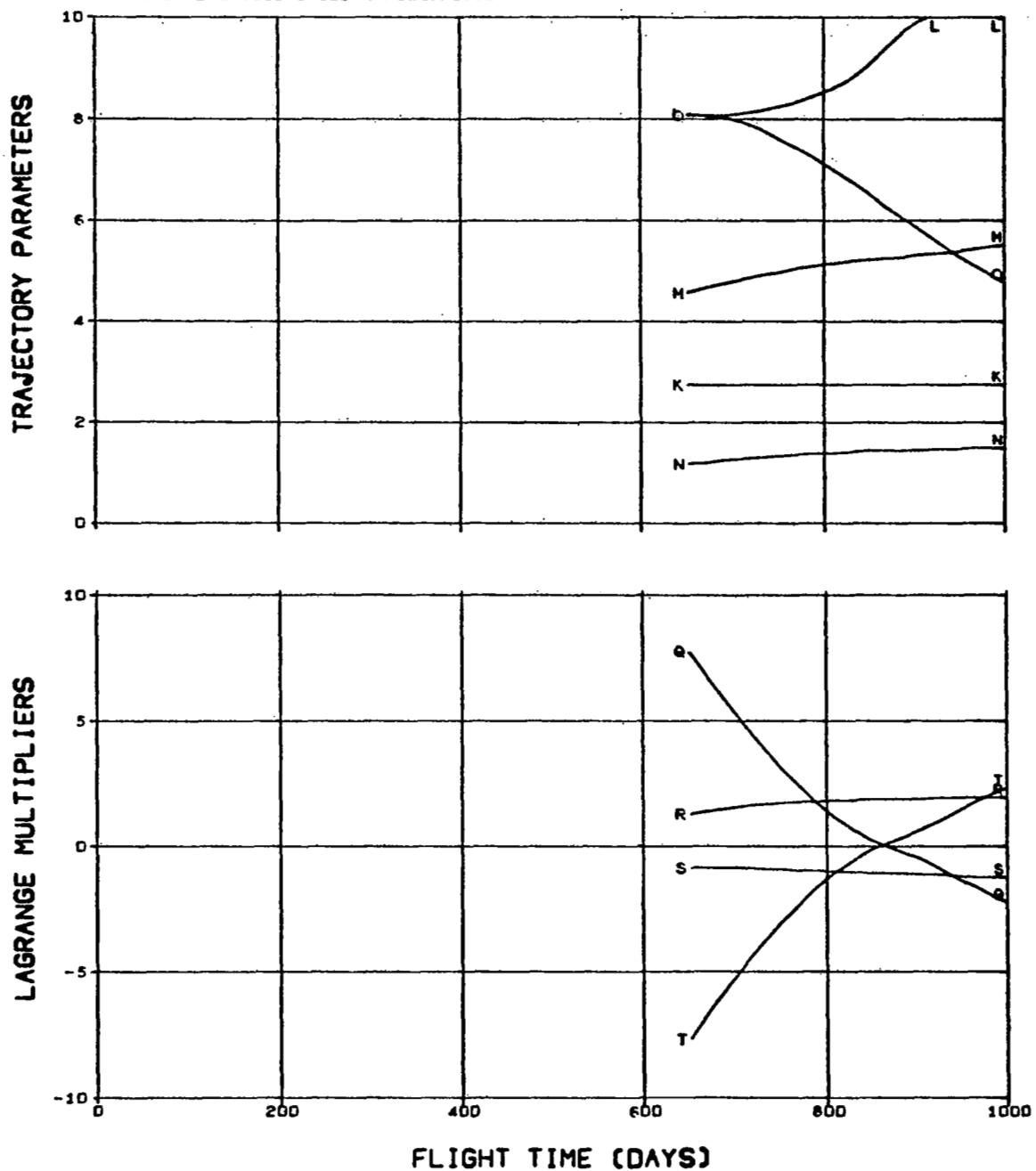


FIG. 4.2.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/100000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.0DE-1
	J PROPULSION TIME (DAYS)/100

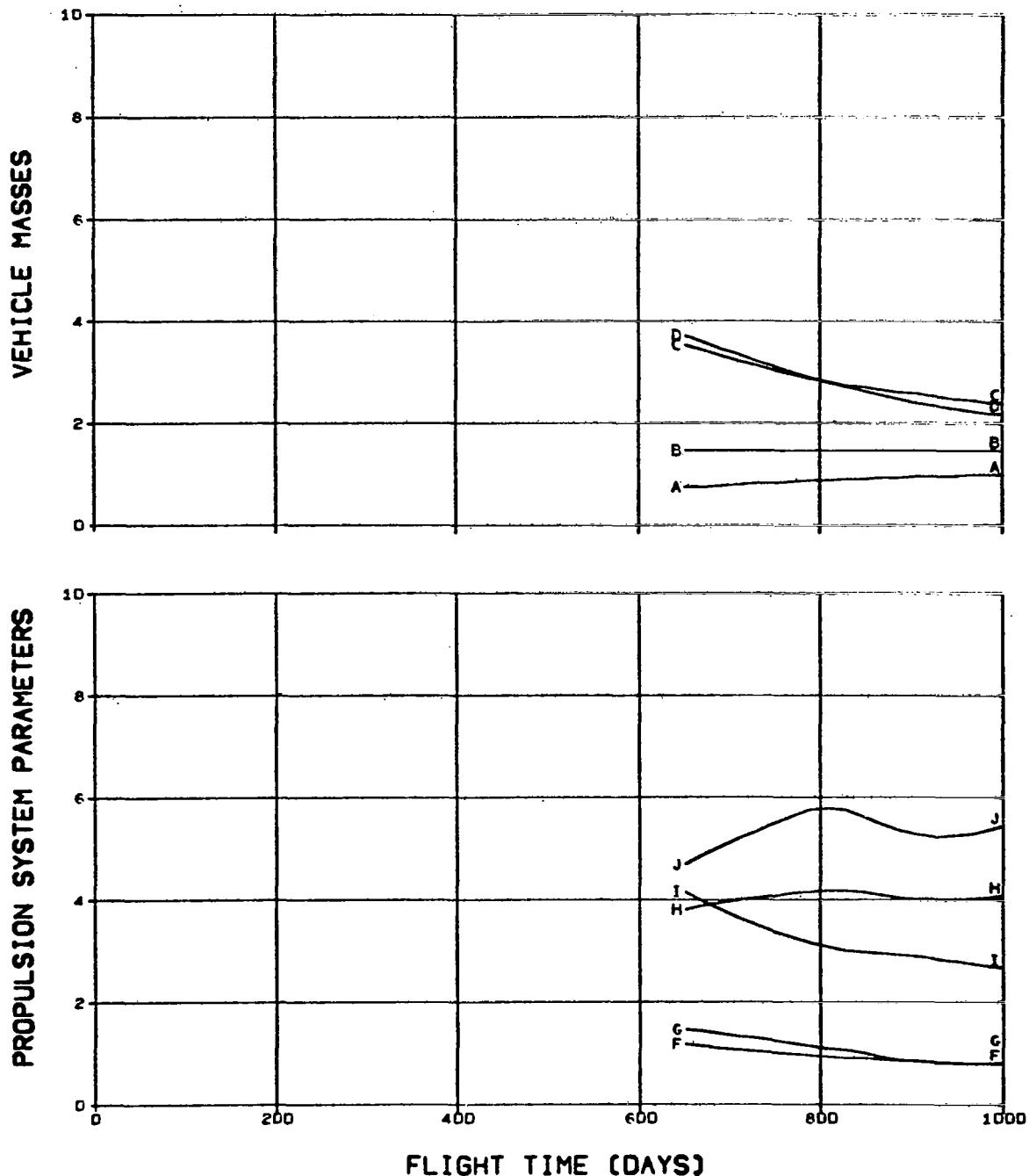


FIG. 4.2.6 CERES MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

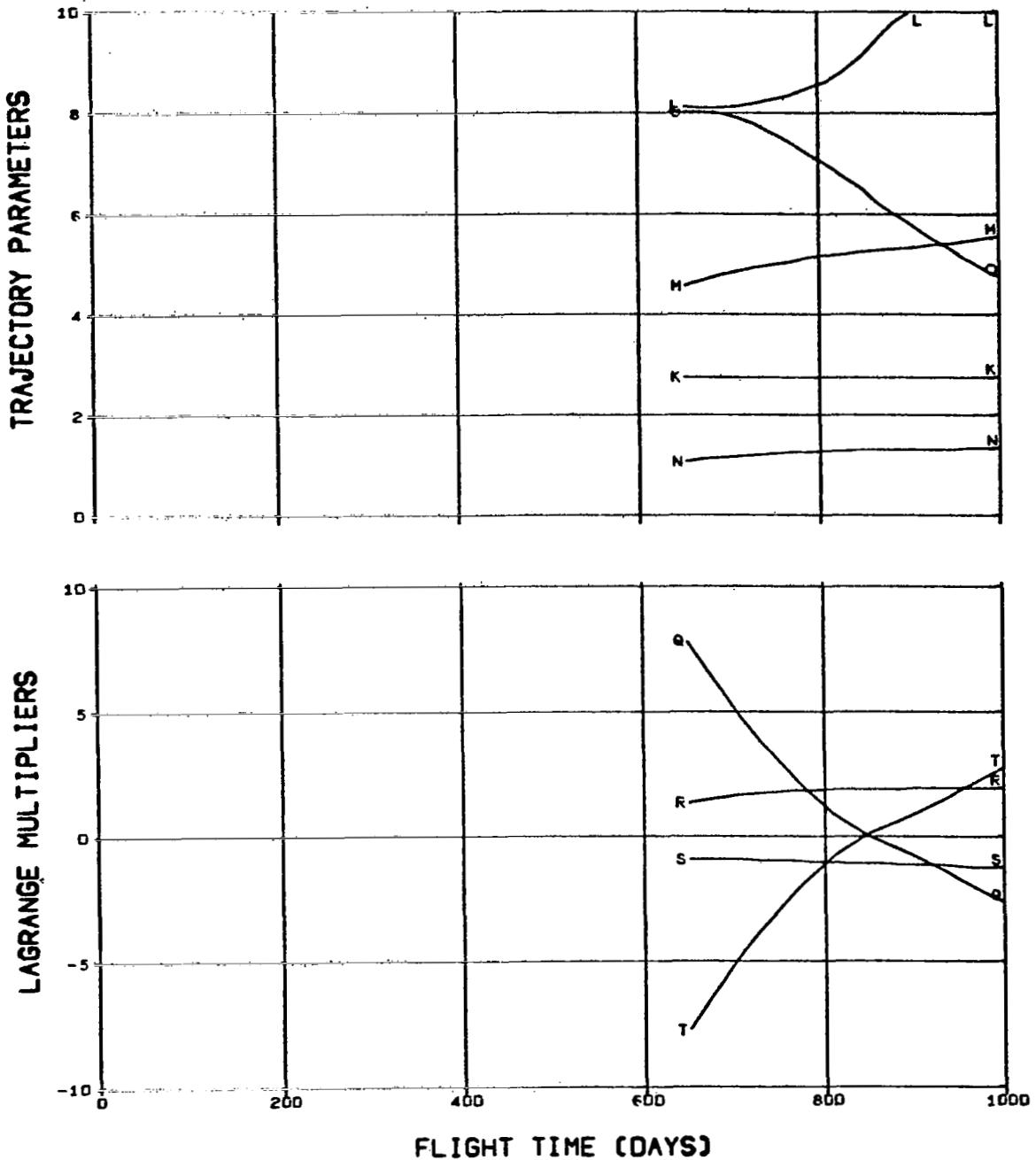


FIG. 4.2.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/100

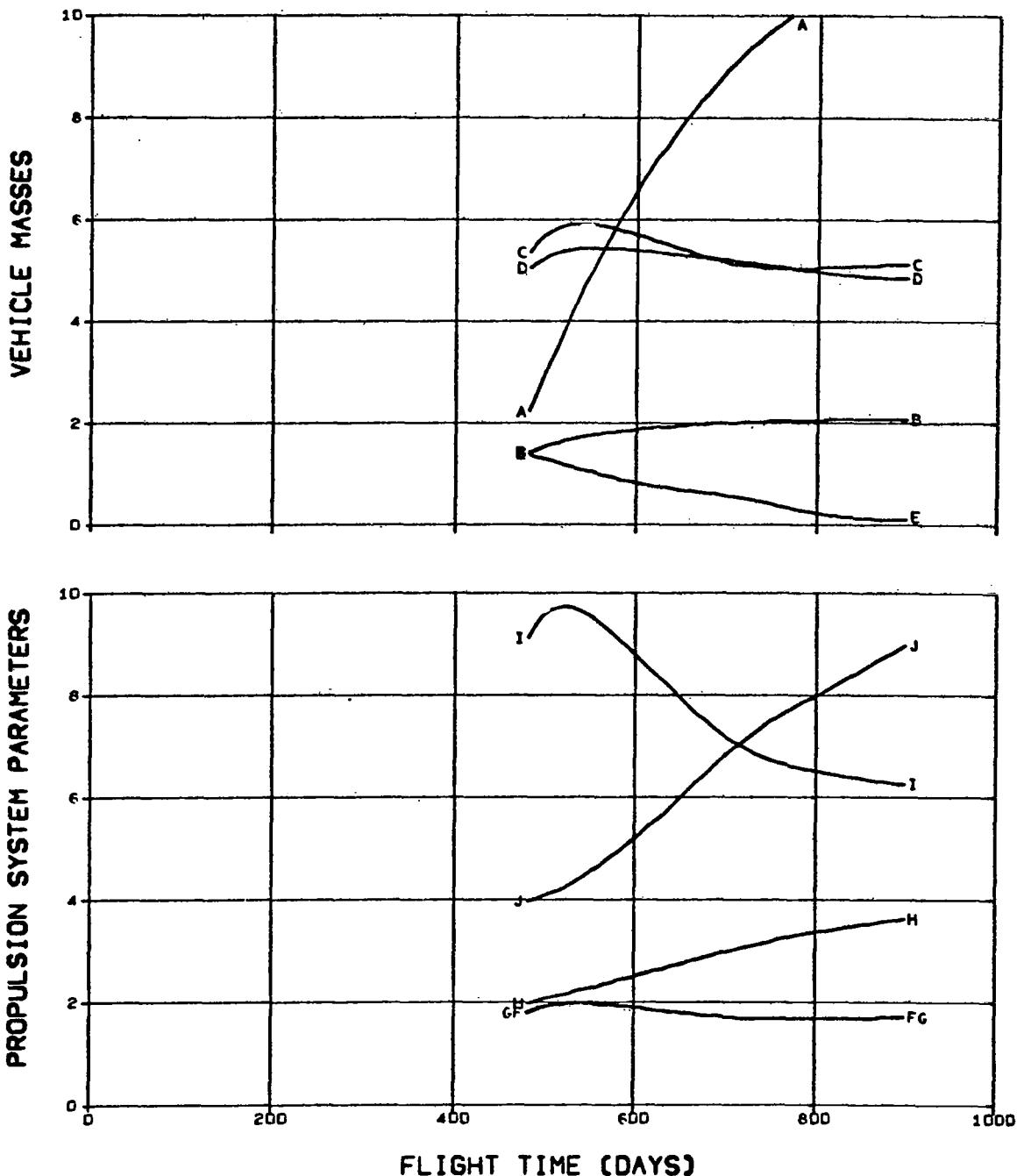


FIG. 4.3.1 CERES MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/100
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/100 T Y-COMPONENT OF PRIMER DERIVATIVE

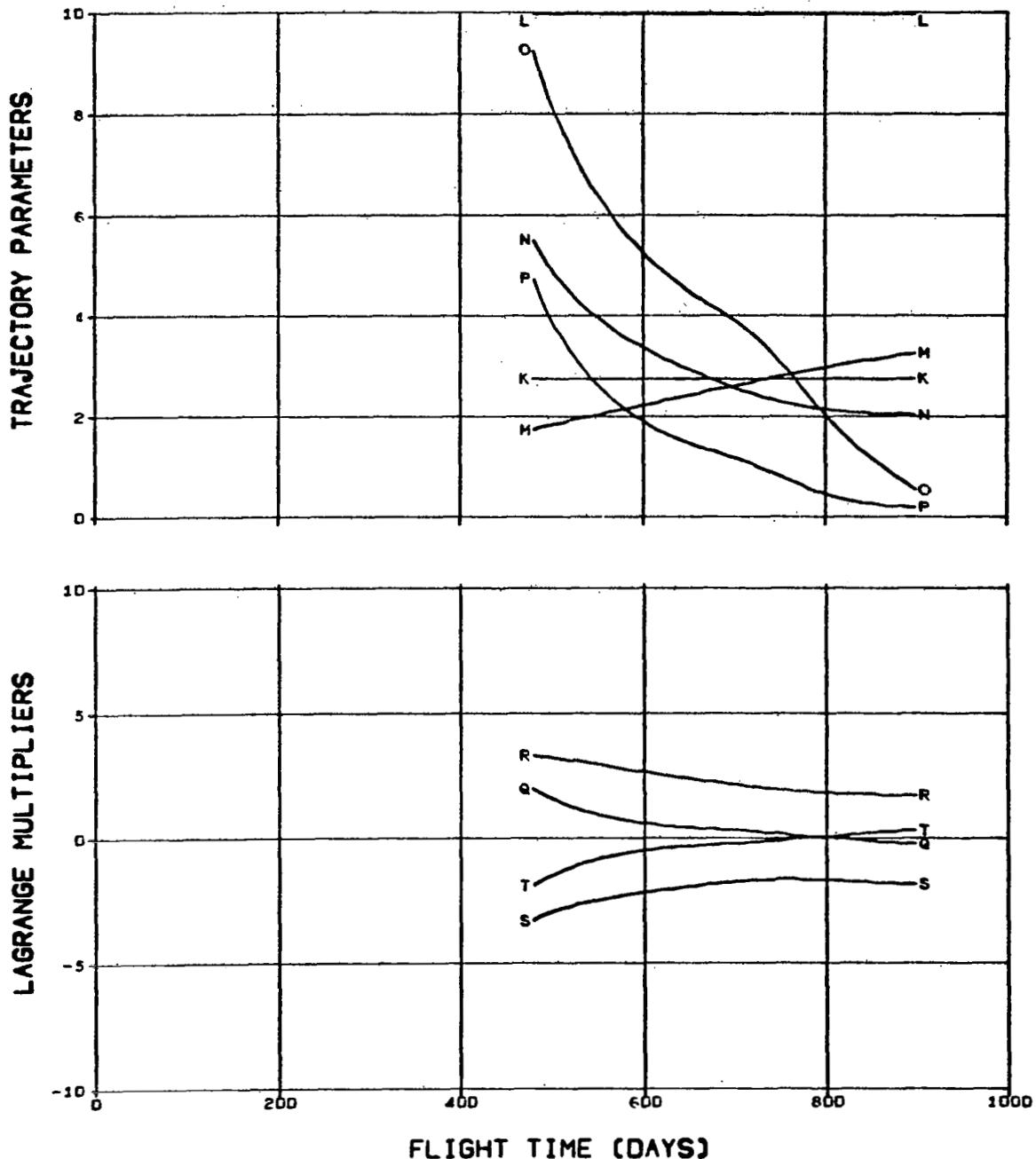
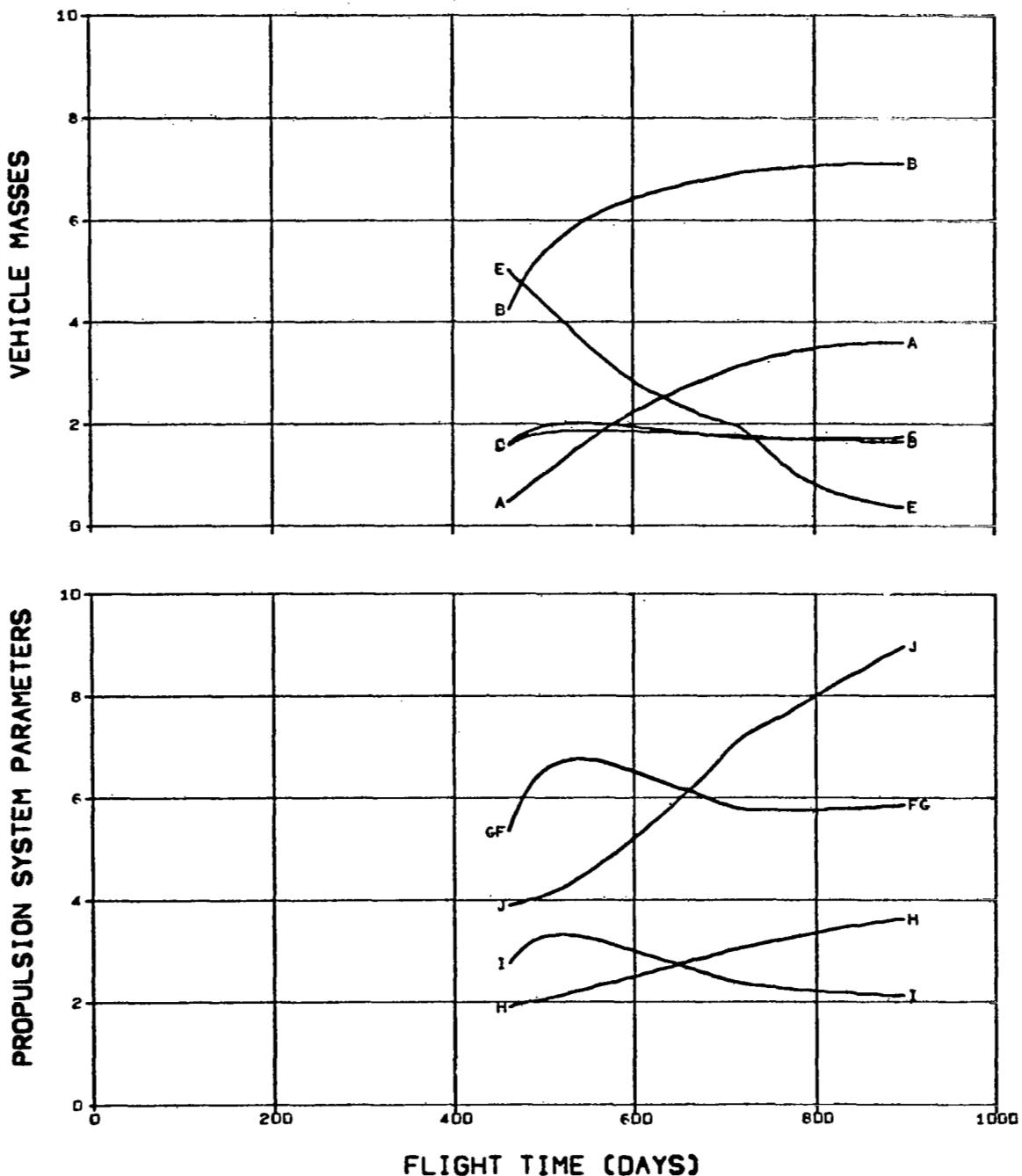


FIG. 4.3.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/100



**FIG. 4.3.2 CERES MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/100
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/100 T Y-COMPONENT OF PRIMER DERIVATIVE

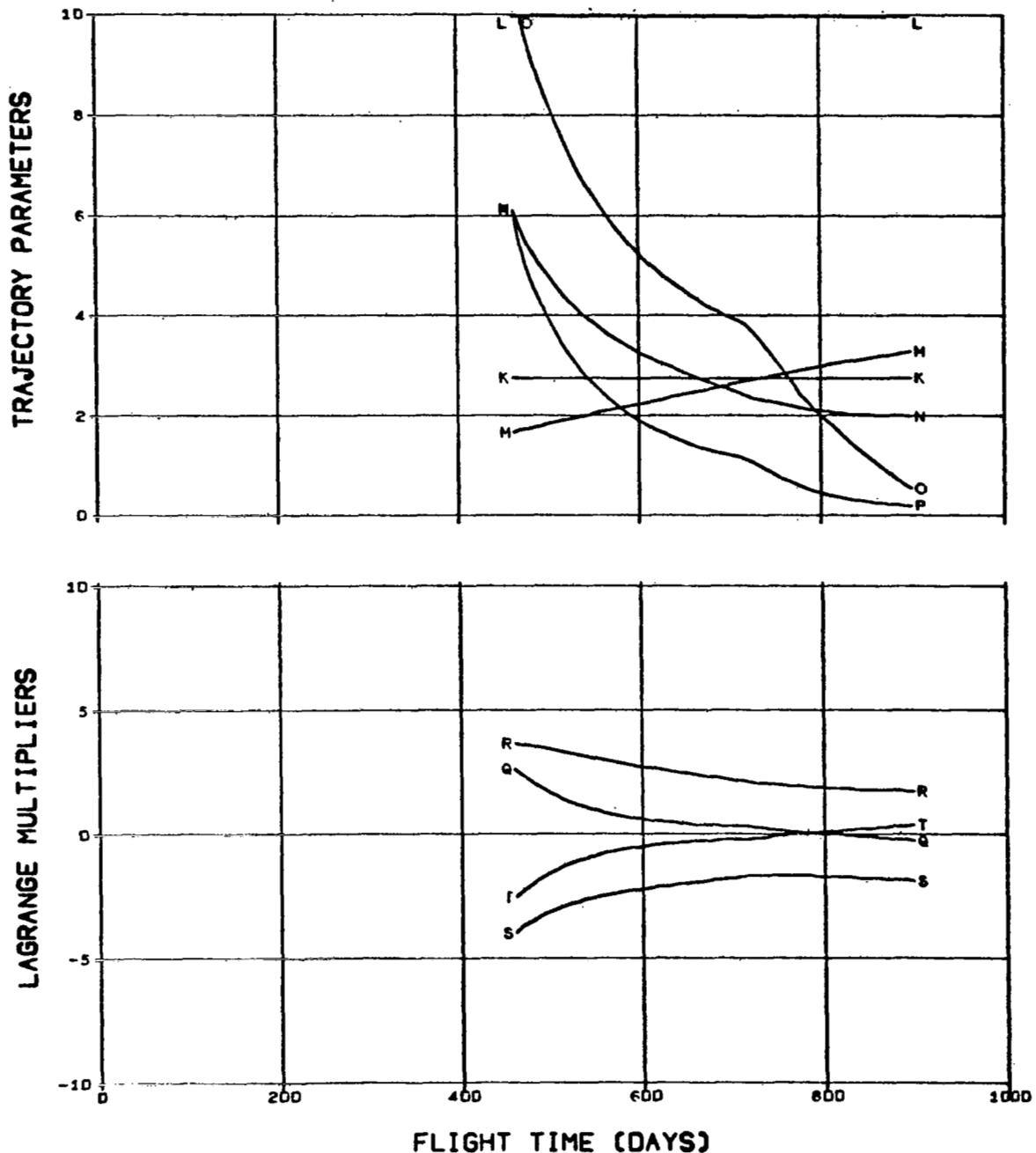


FIG. 4.3.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/1000	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/1000	J PROPULSION TIME (DAYS)/100

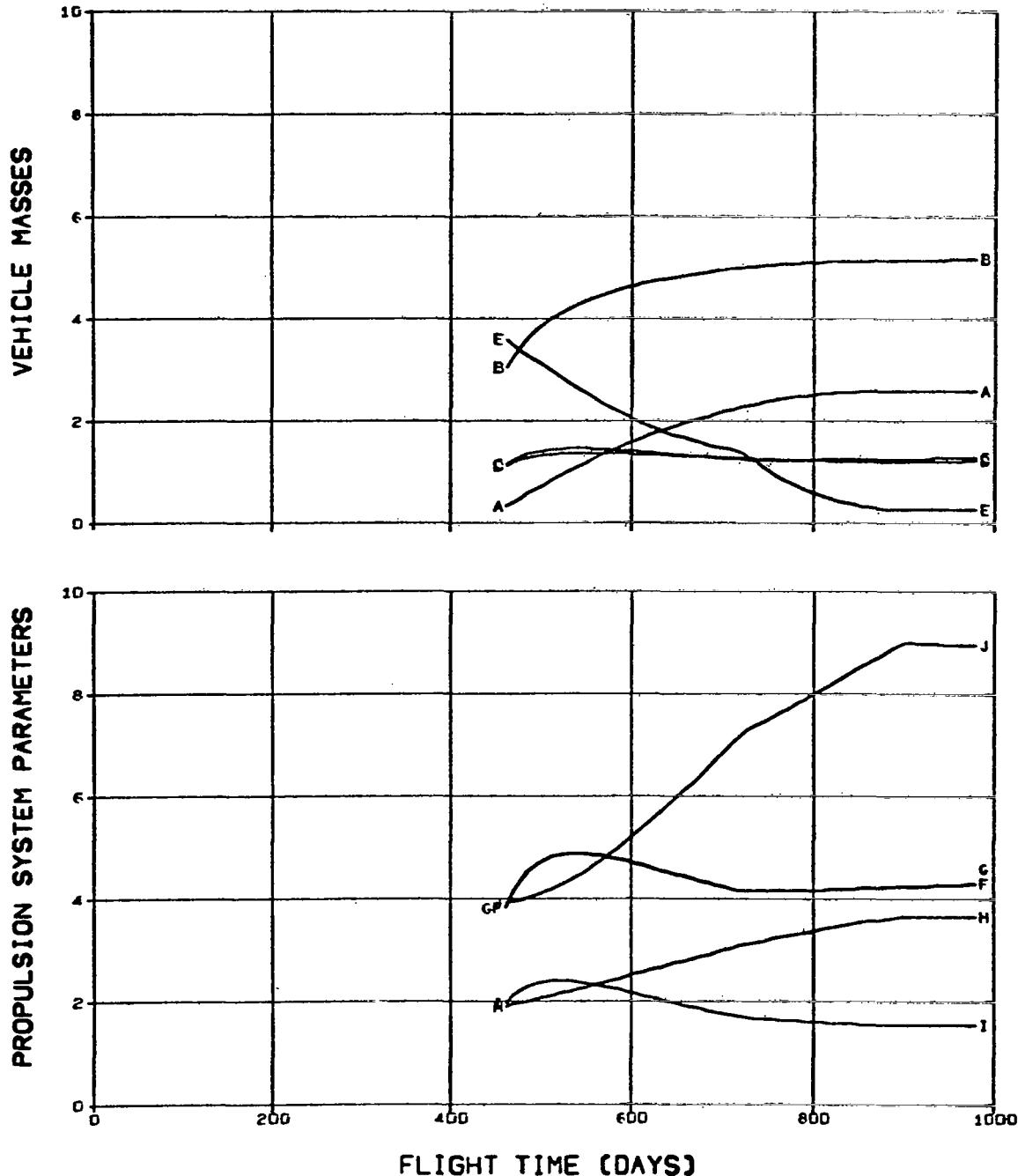


FIG. 4.3.3 CERES MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

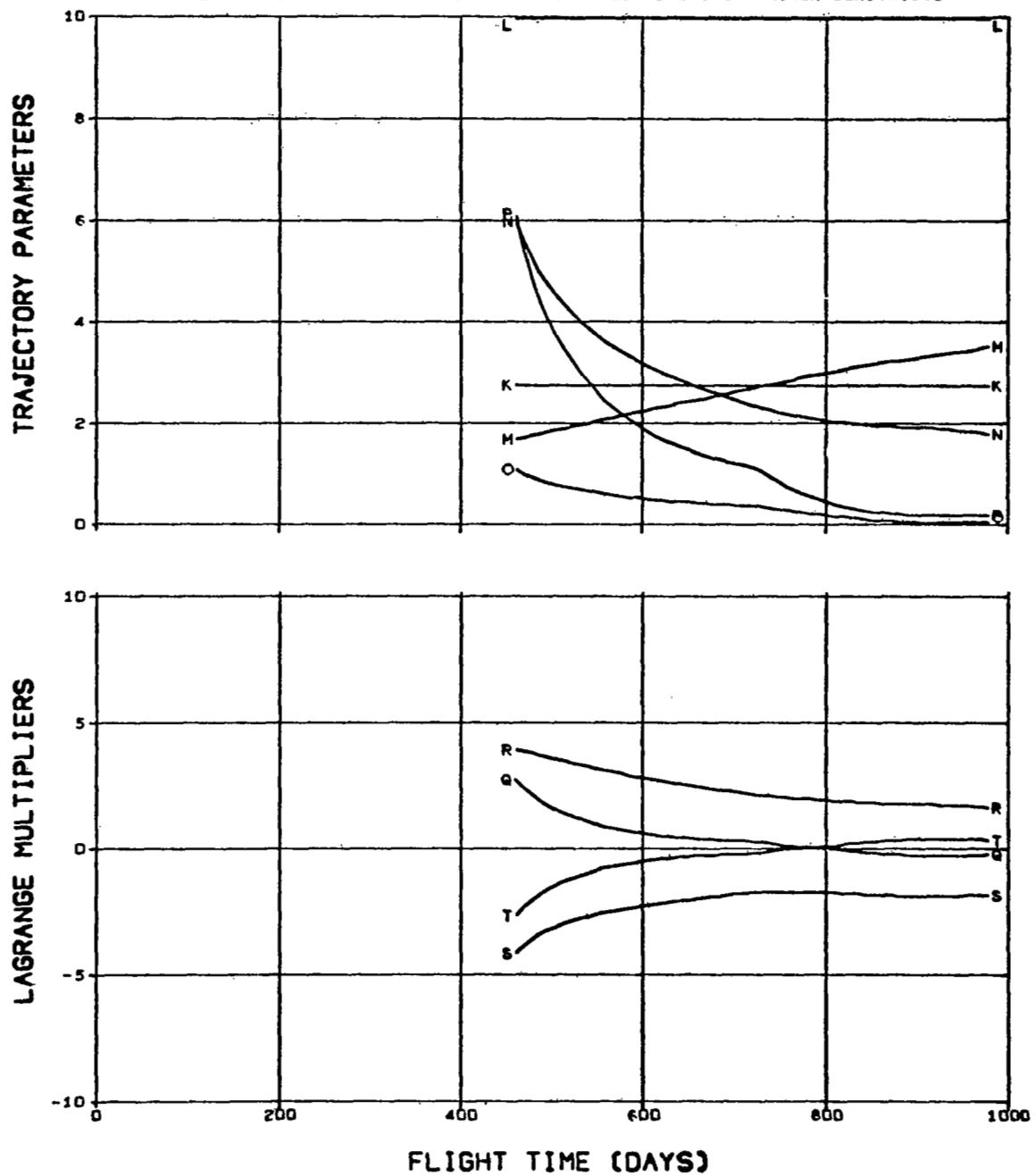


FIG. 4.3.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/10	J	PROPULSION TIME (DAYS)/100

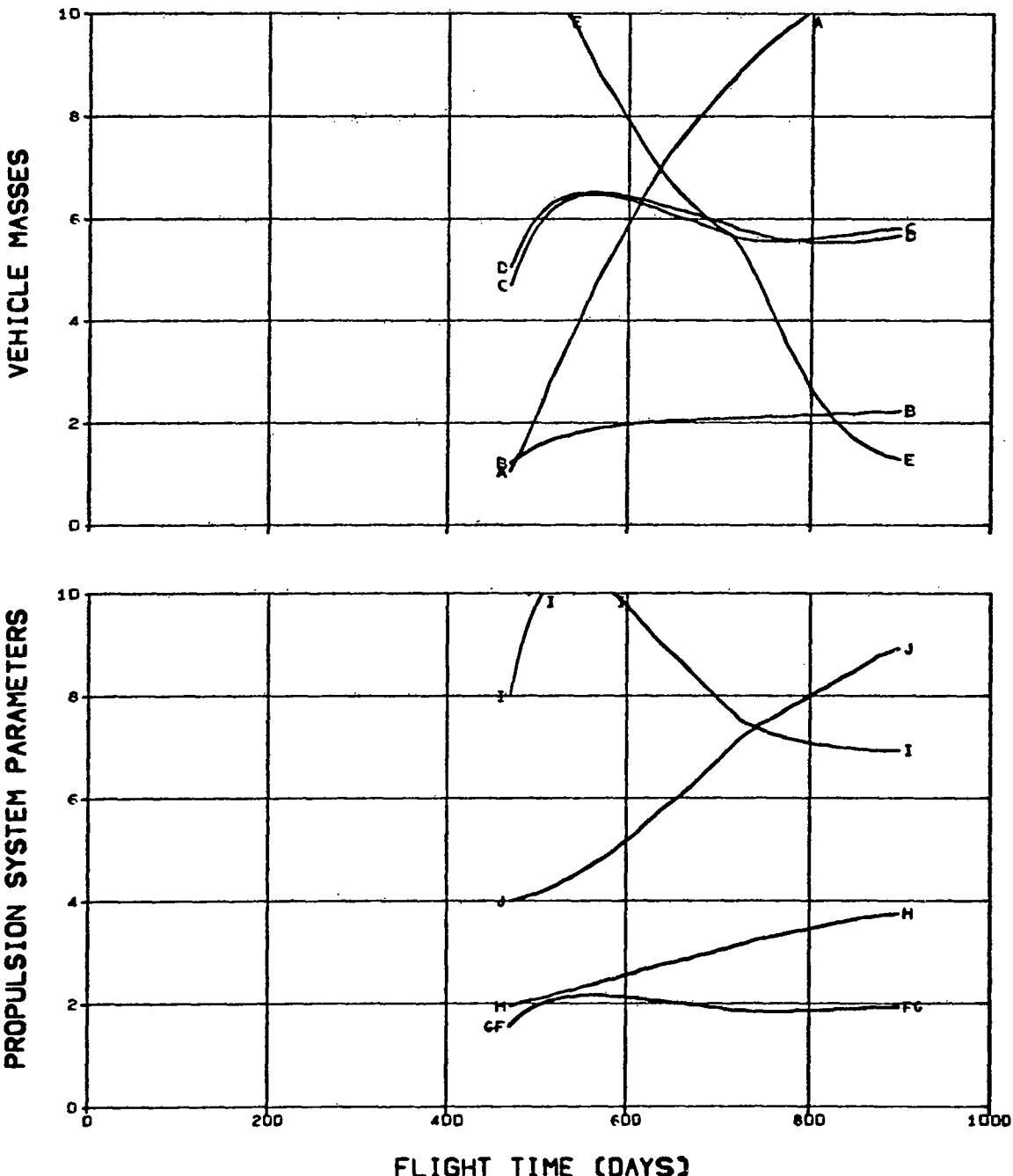


FIG. 4.3.4 CERES MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100	T	Y-COMPONENT OF PRIMER DERIVATIVE

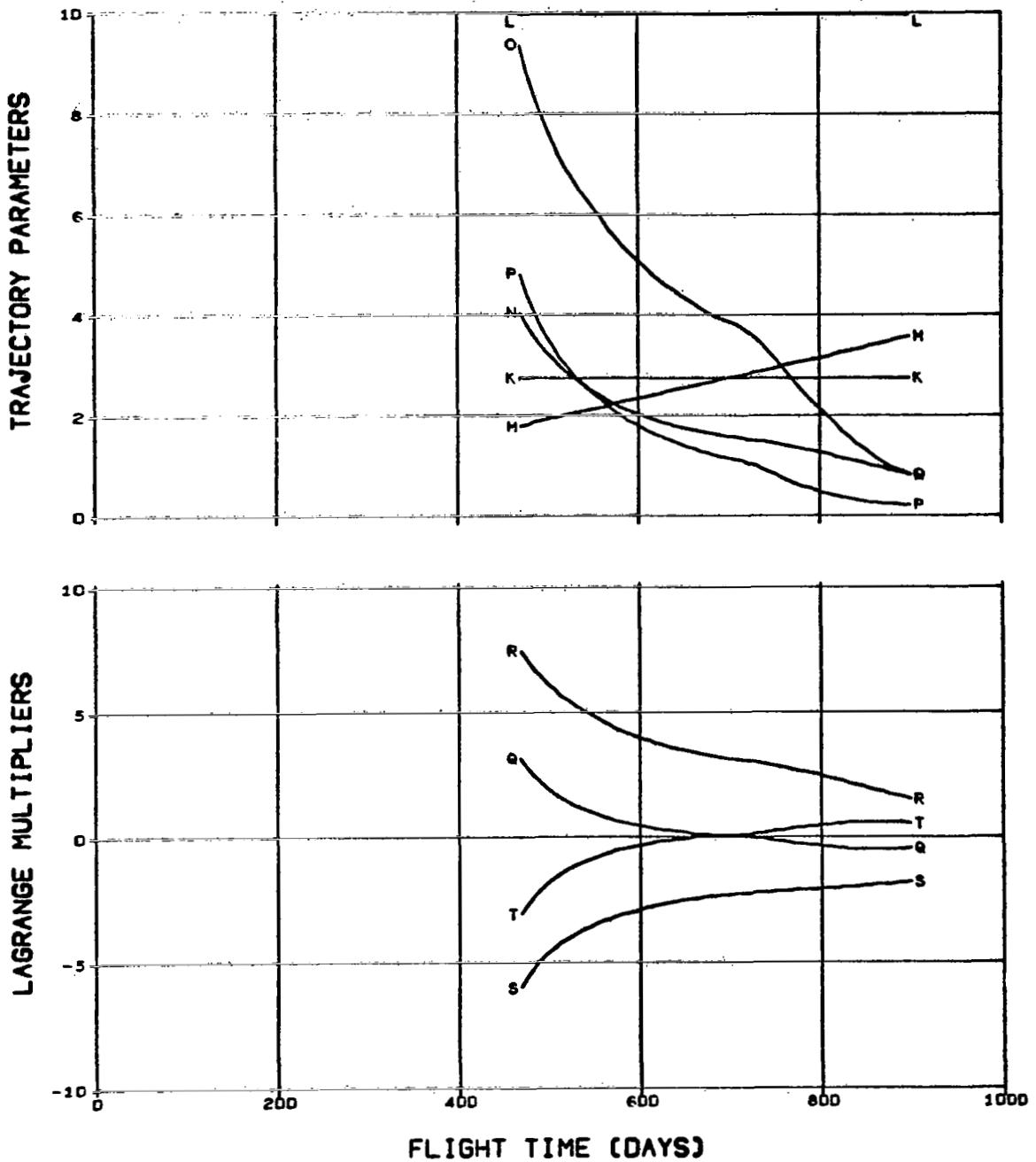


FIG. 4.3.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/100

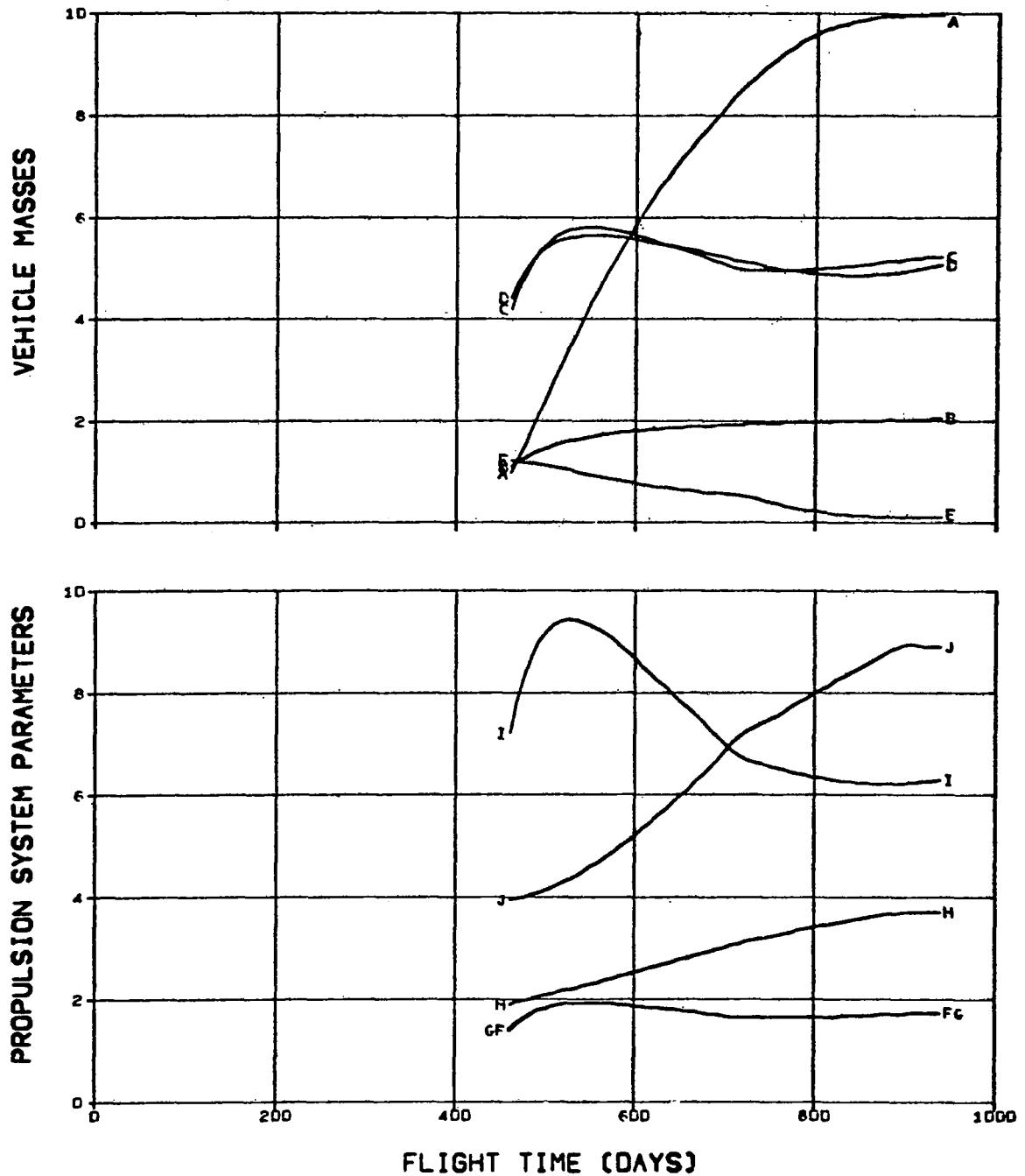


FIG. 4.3.5 CERES MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/100
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100	T	Y-COMPONENT OF PRIMER DERIVATIVE

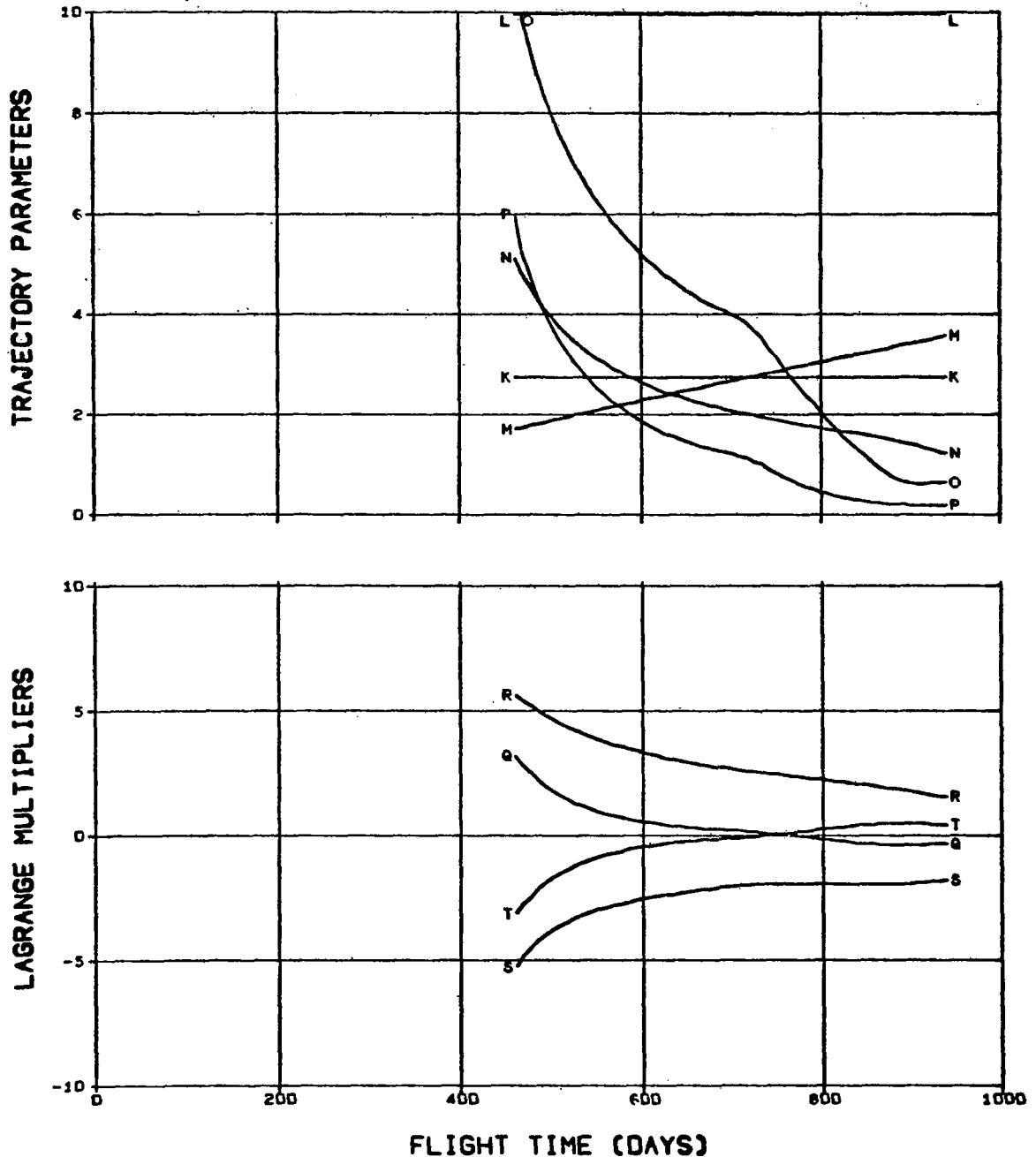
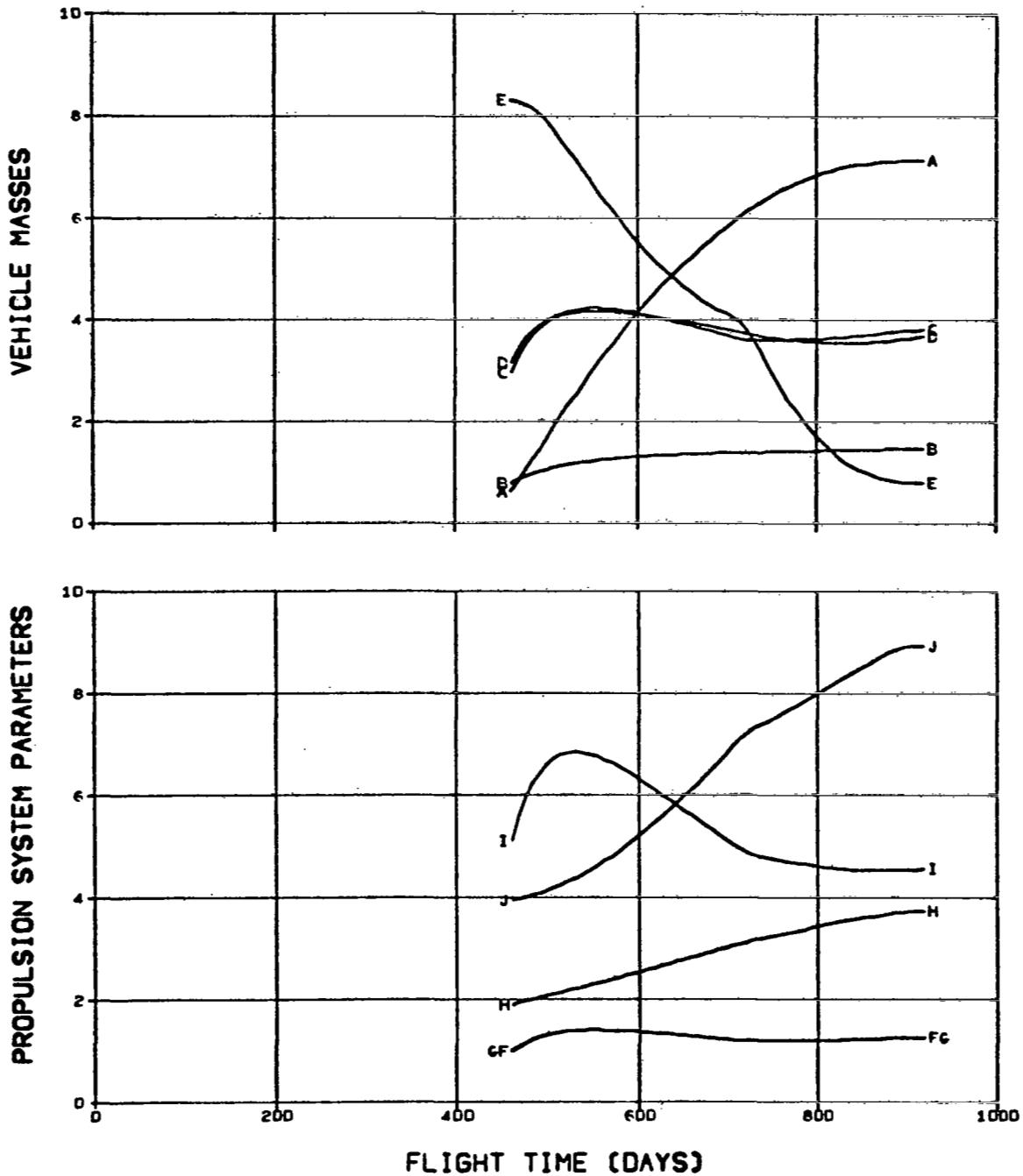


FIG. 4.3.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-3
E	RETRO PROPELLANT MASS (KG)/10	J	PROPULSION TIME (DAYS)/100



**FIG. 4.3.6 CERES MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/100
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEC)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/100 T Y-COMPONENT OF PRIMER DERIVATIVE

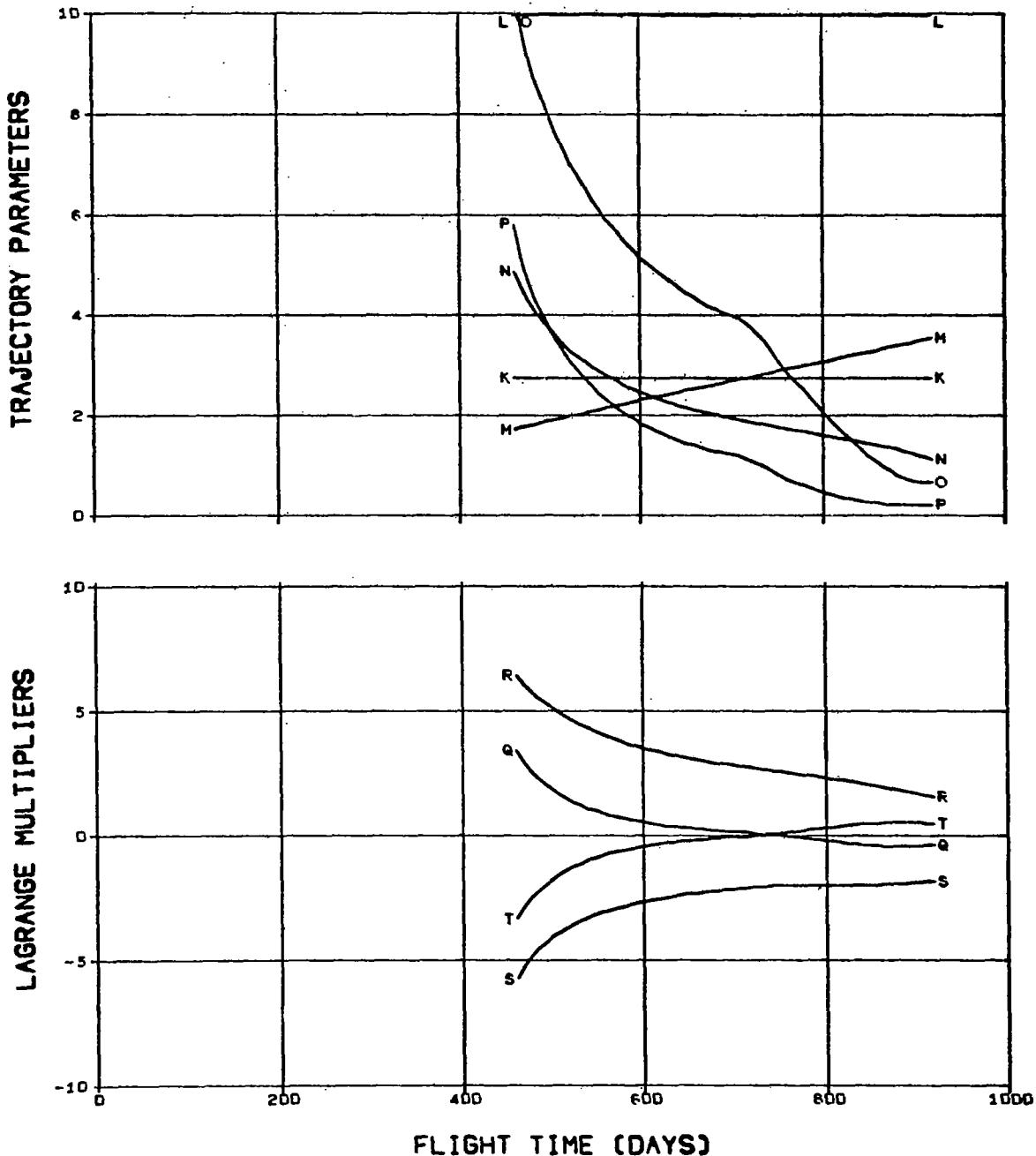
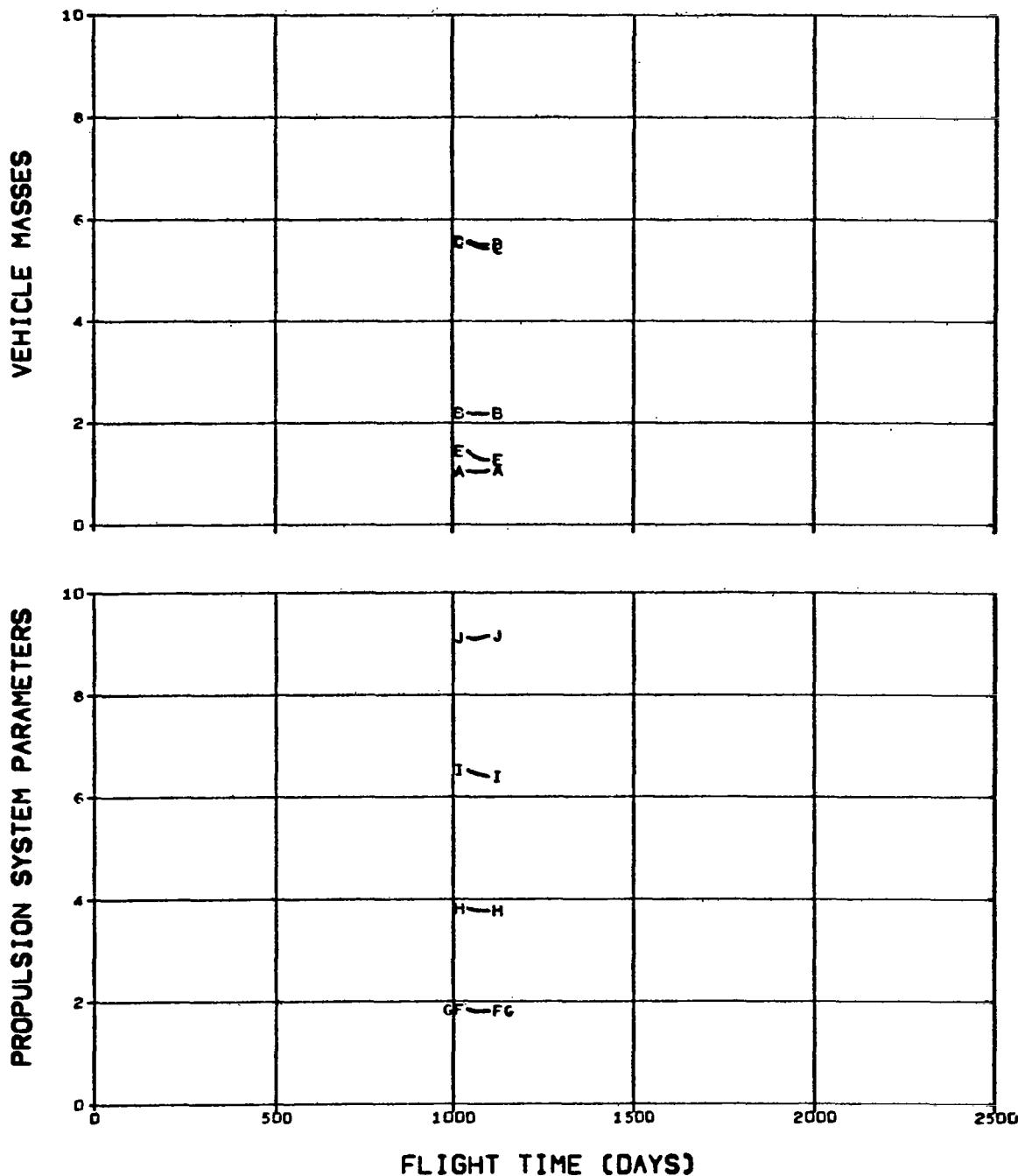


FIG. 4.3.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/100



**FIG. 4.5.1 CERES MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER/1.0DE-1
 N LAUNCH EXCESS SPEED (M/SEC)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/100 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

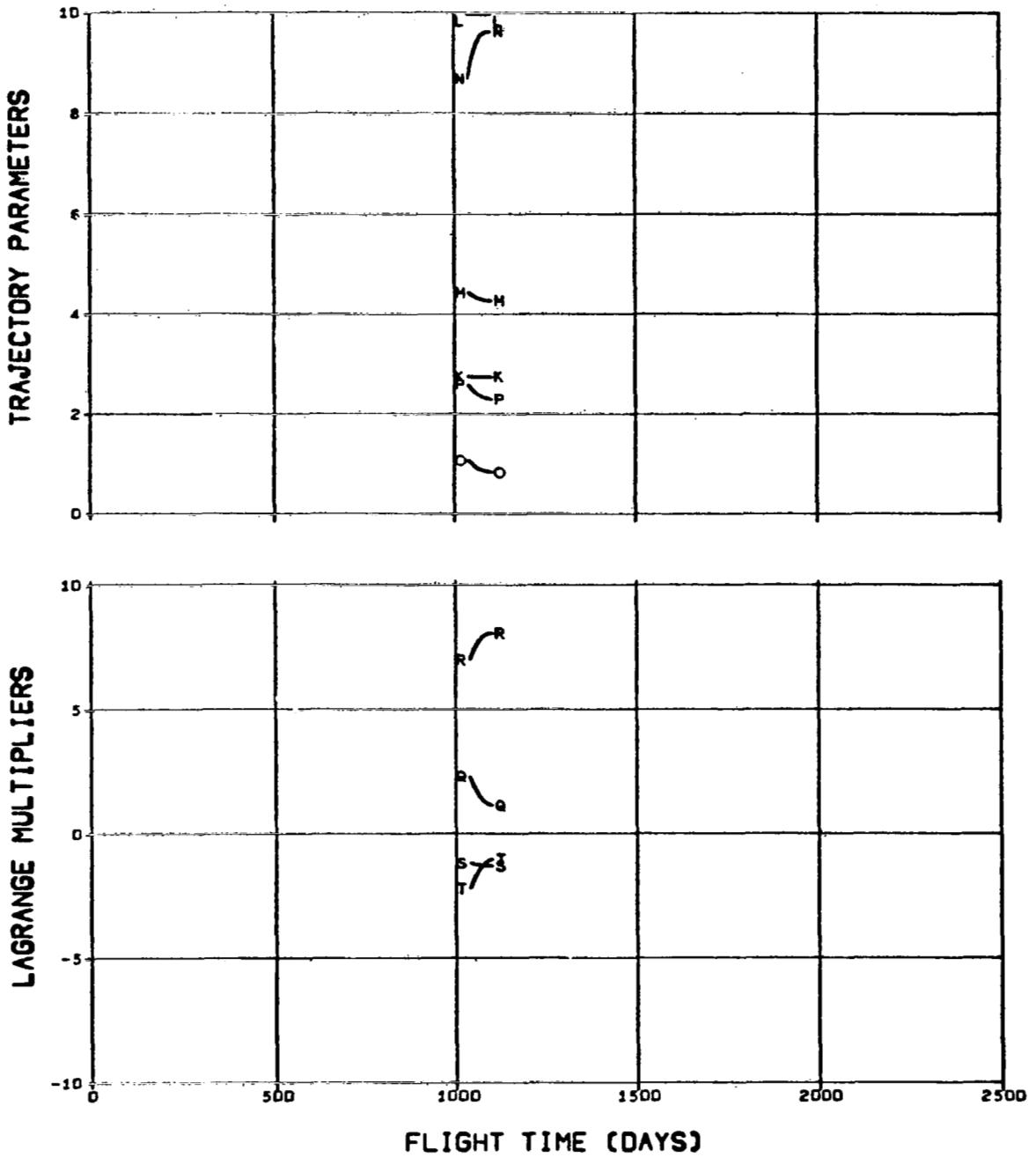


FIG. 4.5.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/10	J	PROPULSION TIME (DAYS)/100

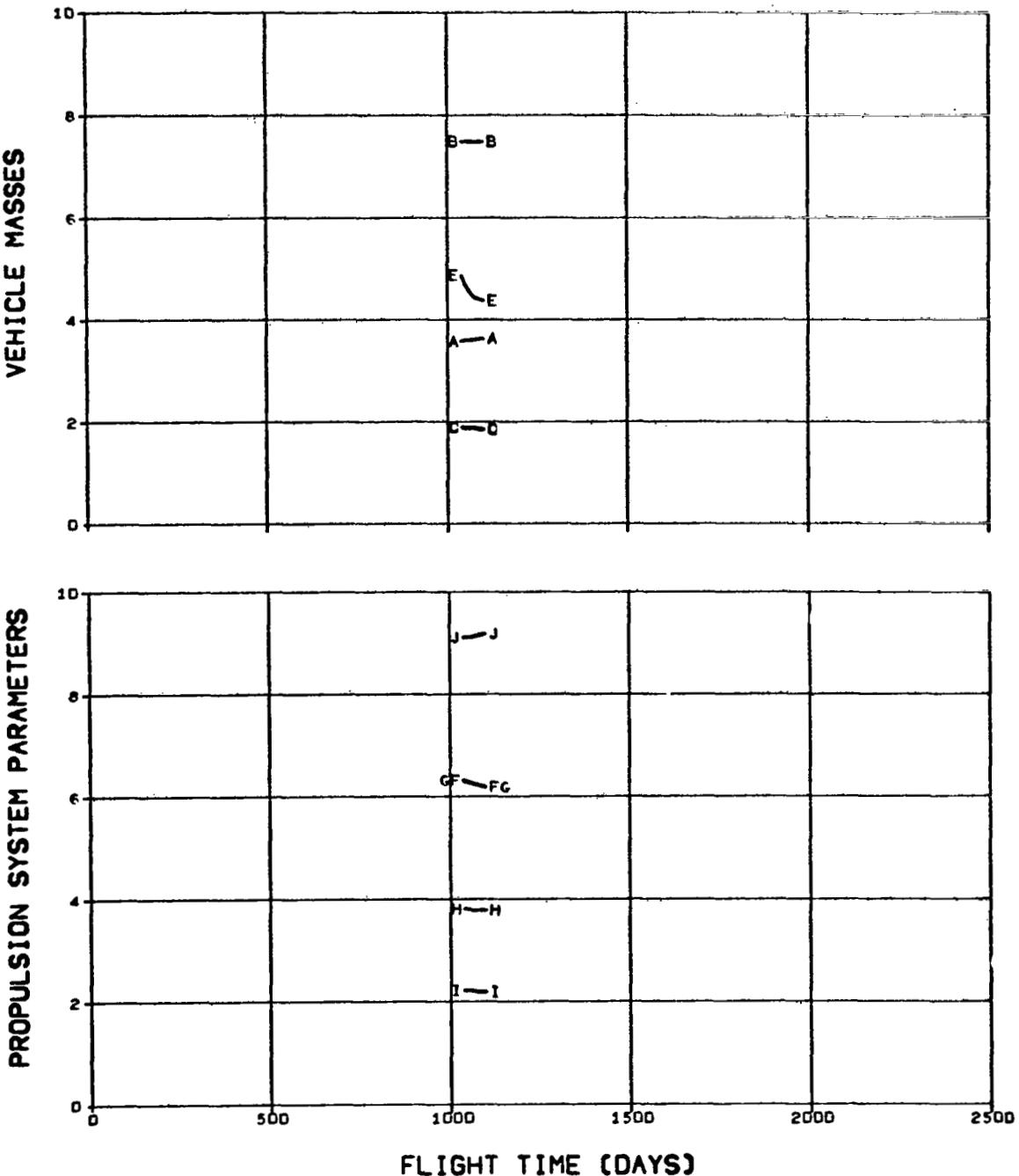


FIG. 4.5.2 CERES MODE B ORBITER MISSIONS
TITAN III X[1207]/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/10
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPERTHIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/1.00E-1
N	LAUNCH EXCESS SPEED (M/SEC)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

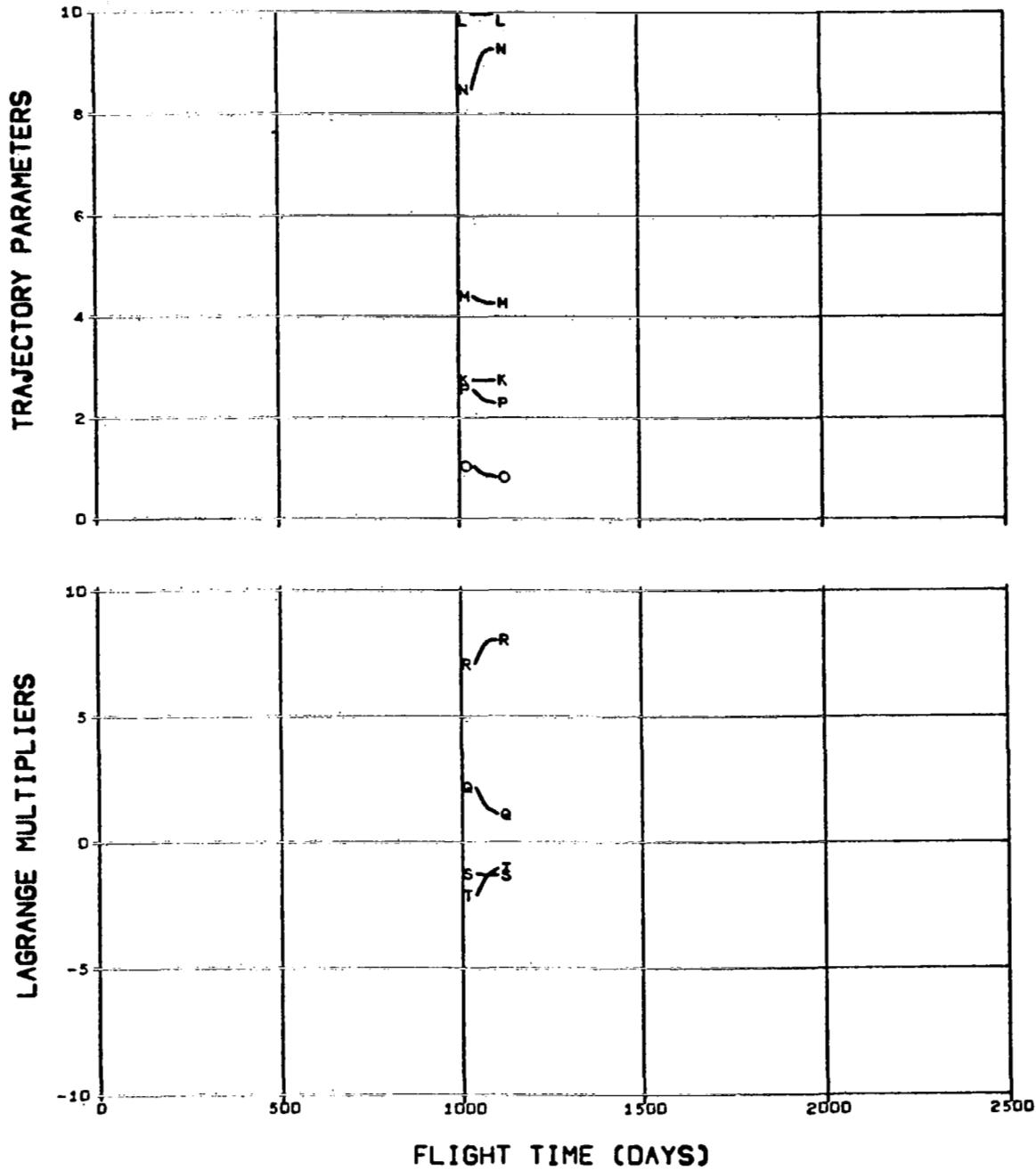
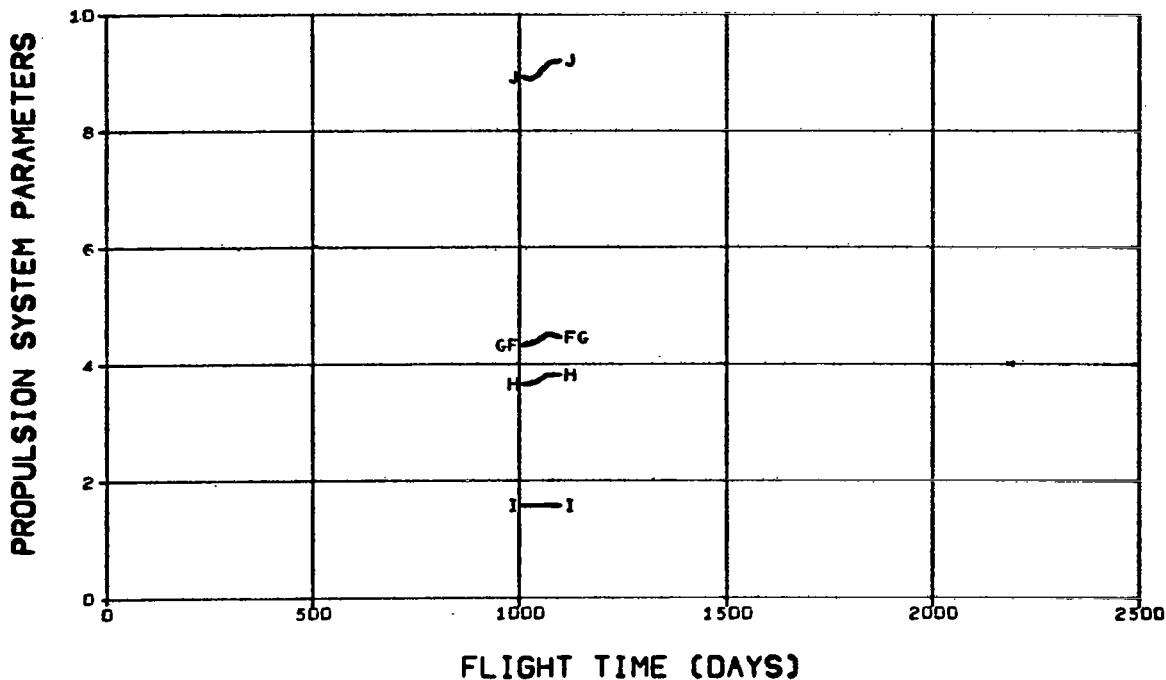
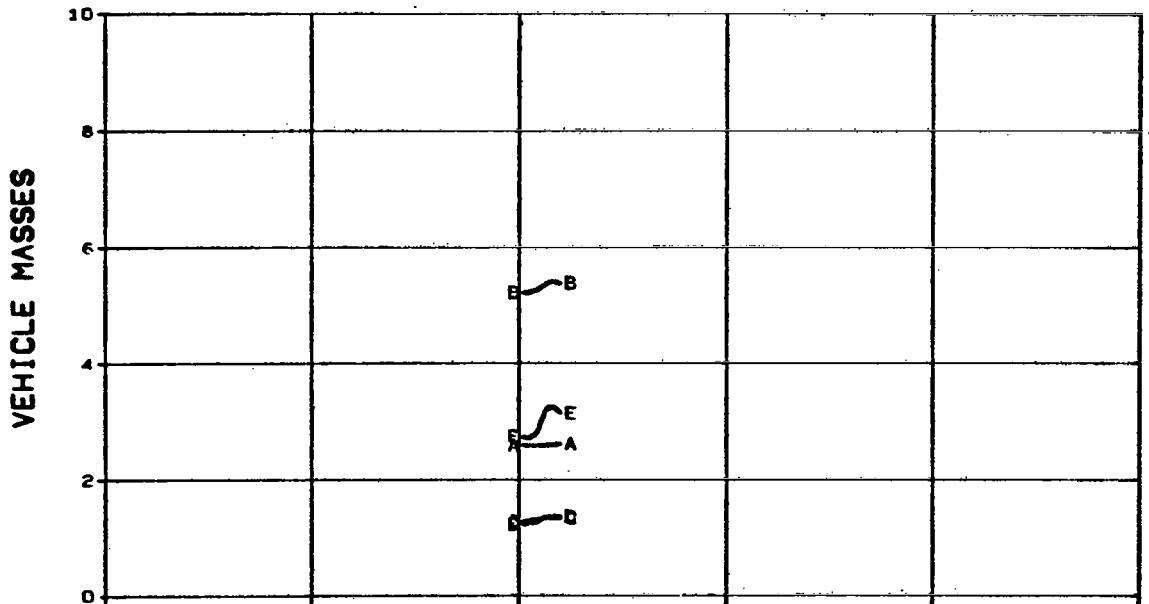


FIG. 4.5.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/1000	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/10	J PROPULSION TIME (DAYS)/100



**FIG. 4.5.3 CERES MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/10
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

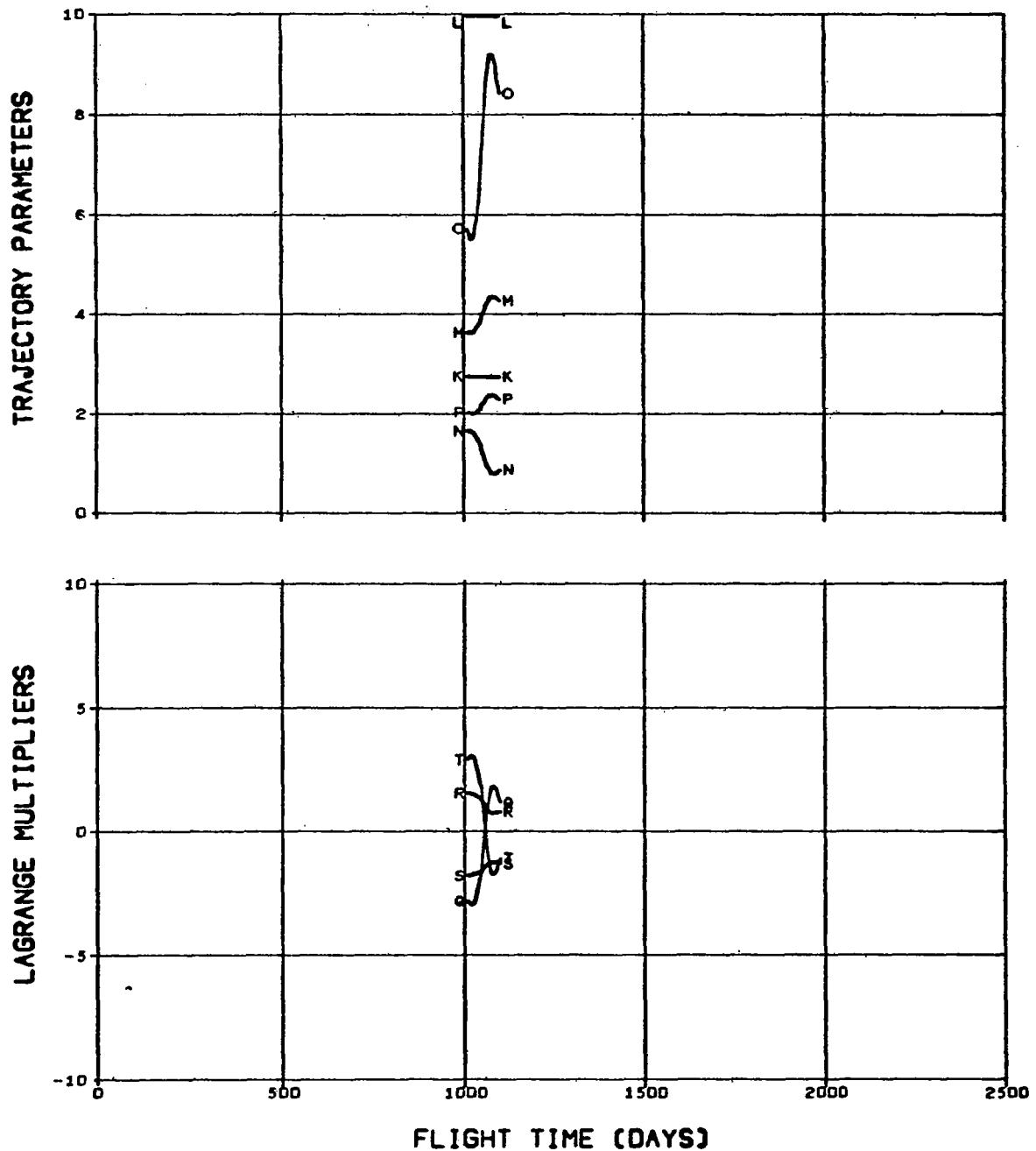


FIG. 4.5.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/10	J	PROPULSION TIME (DAYS)/100

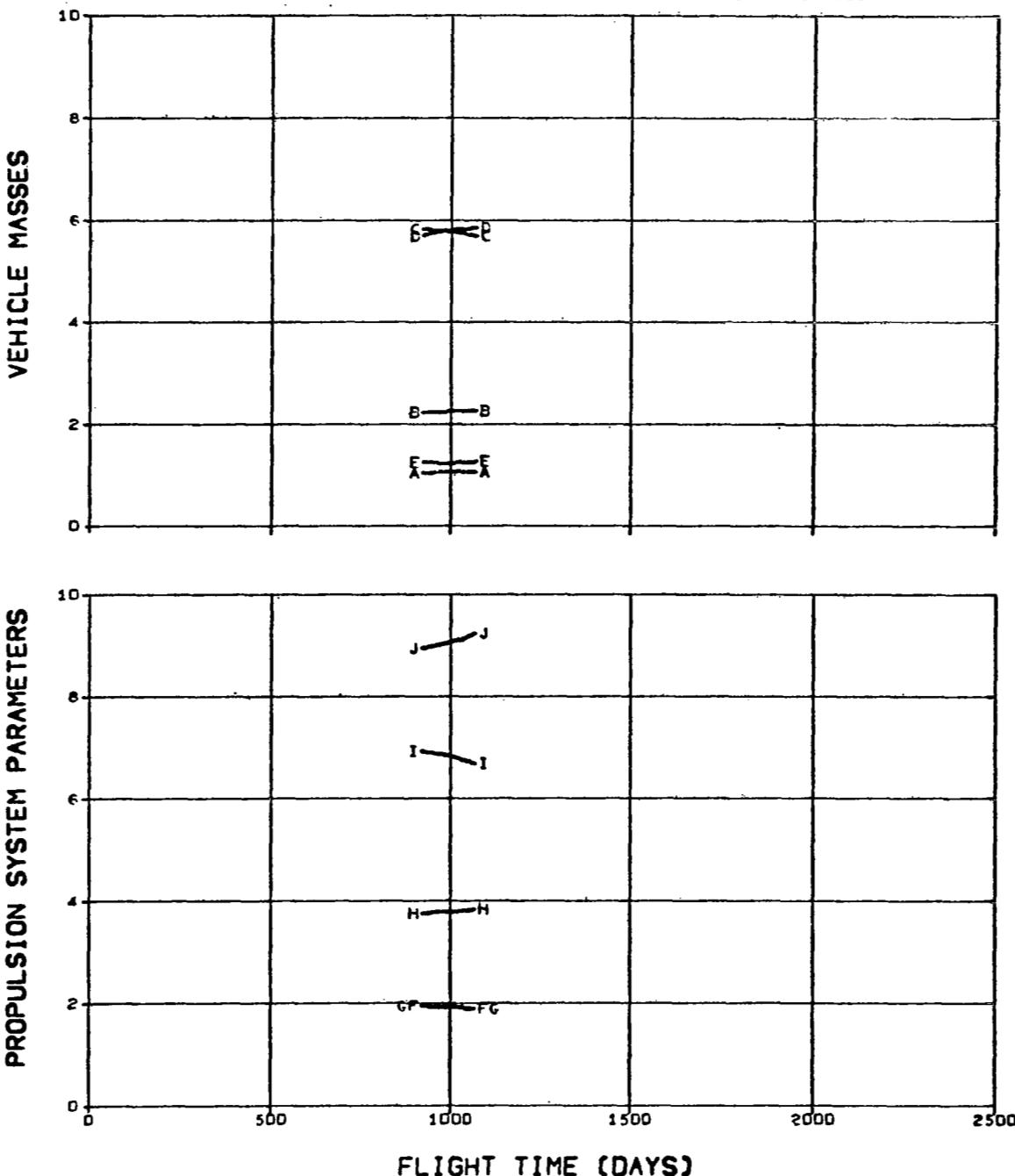


FIG. 4.5.4 CERES MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/10
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-2

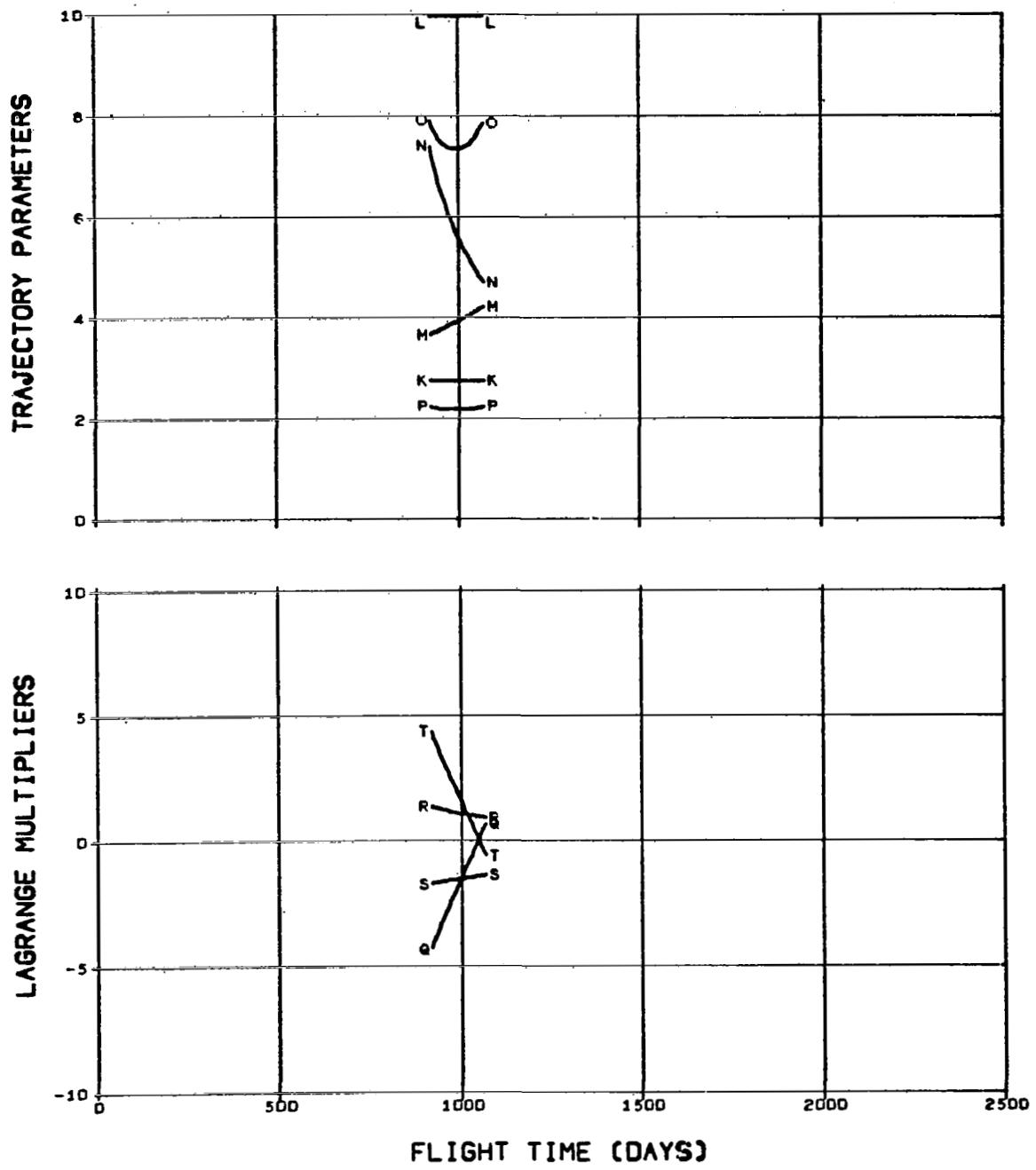


FIG. 4.5.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/10	J	PROPULSION TIME (DAYS)/100

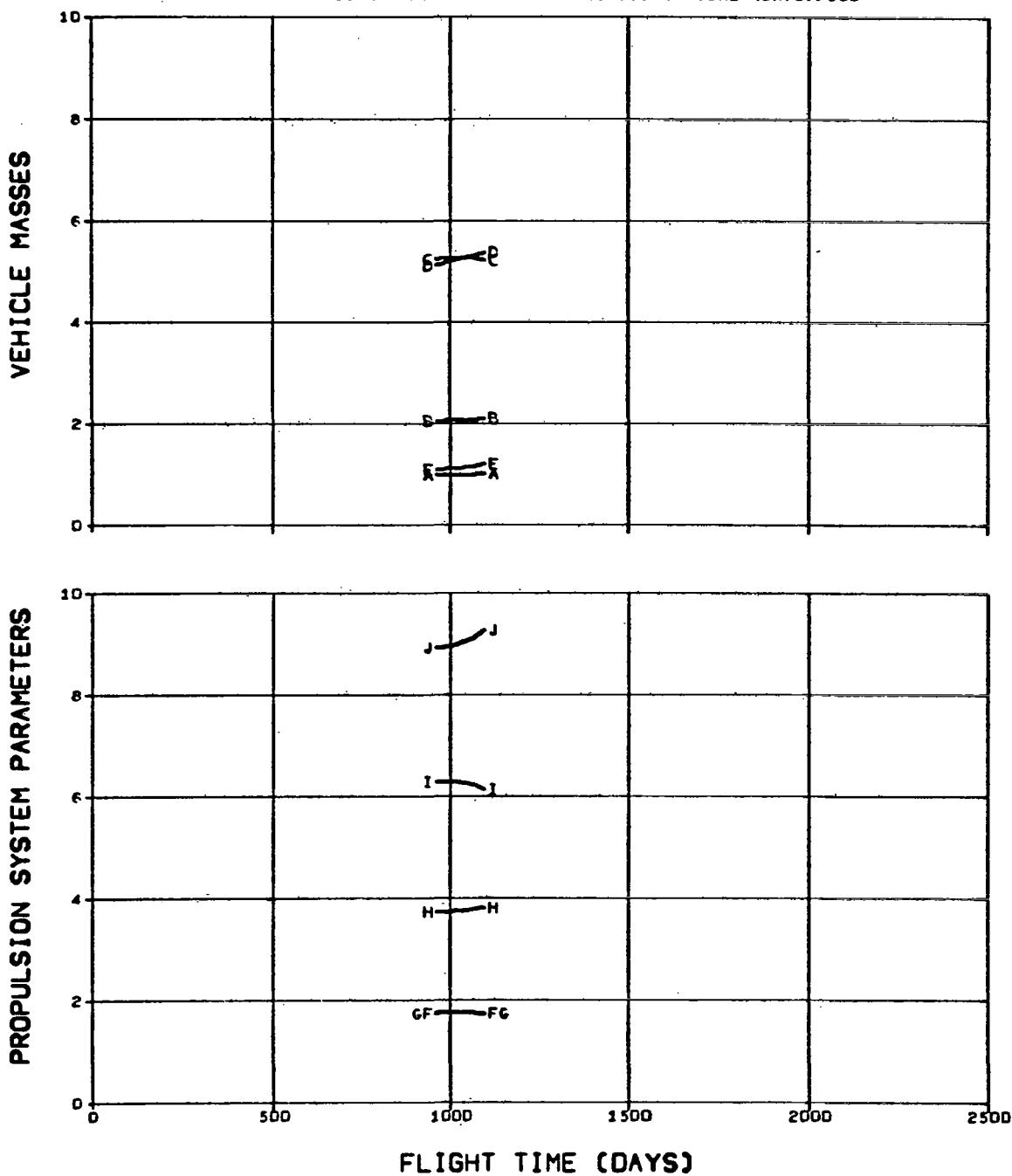


FIG. 4.5.5 CERES MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/10
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

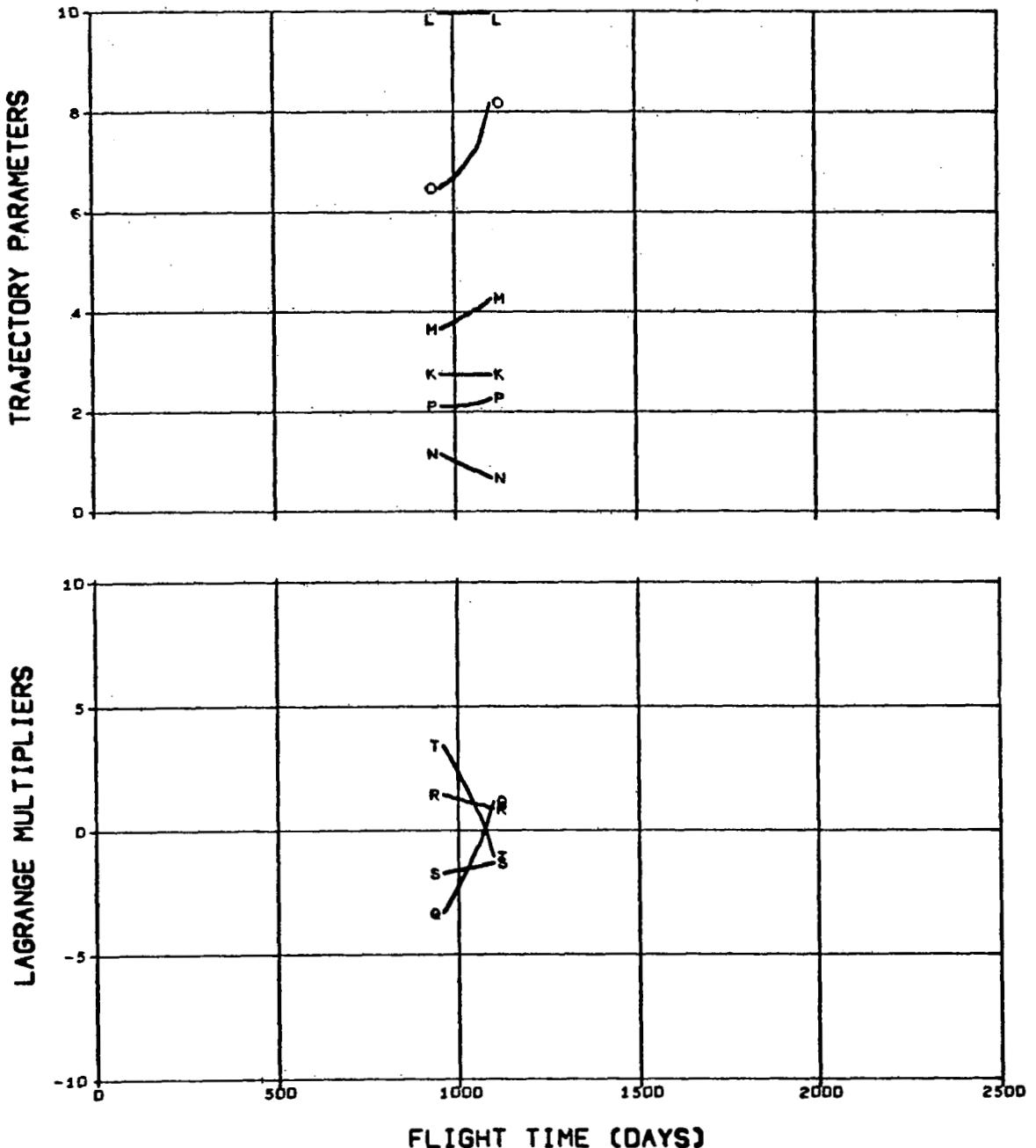
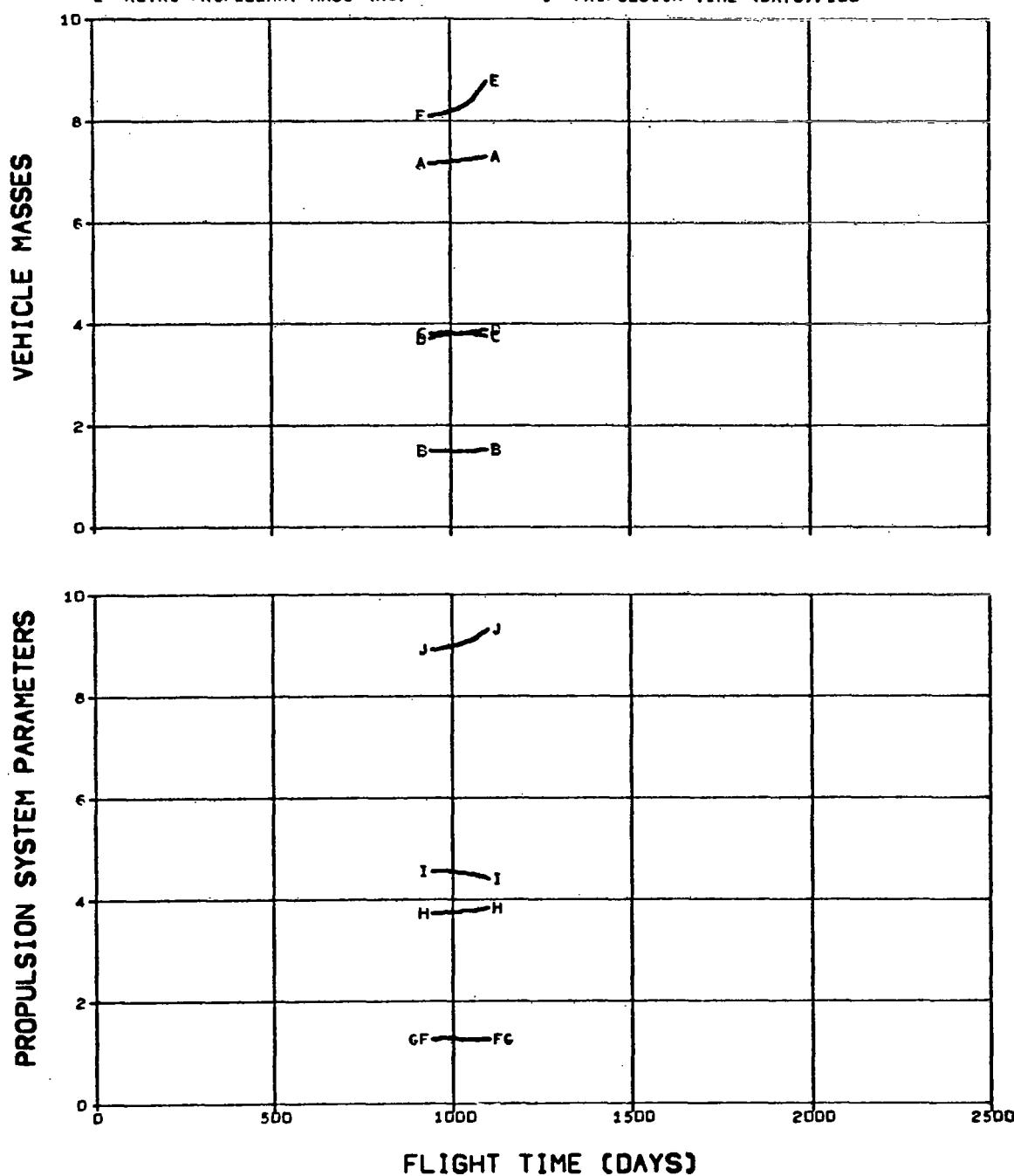


FIG. 4.5.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)	J	PROPULSION TIME (DAYS)/100



**FIG. 4.5.6 CERES MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/10
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

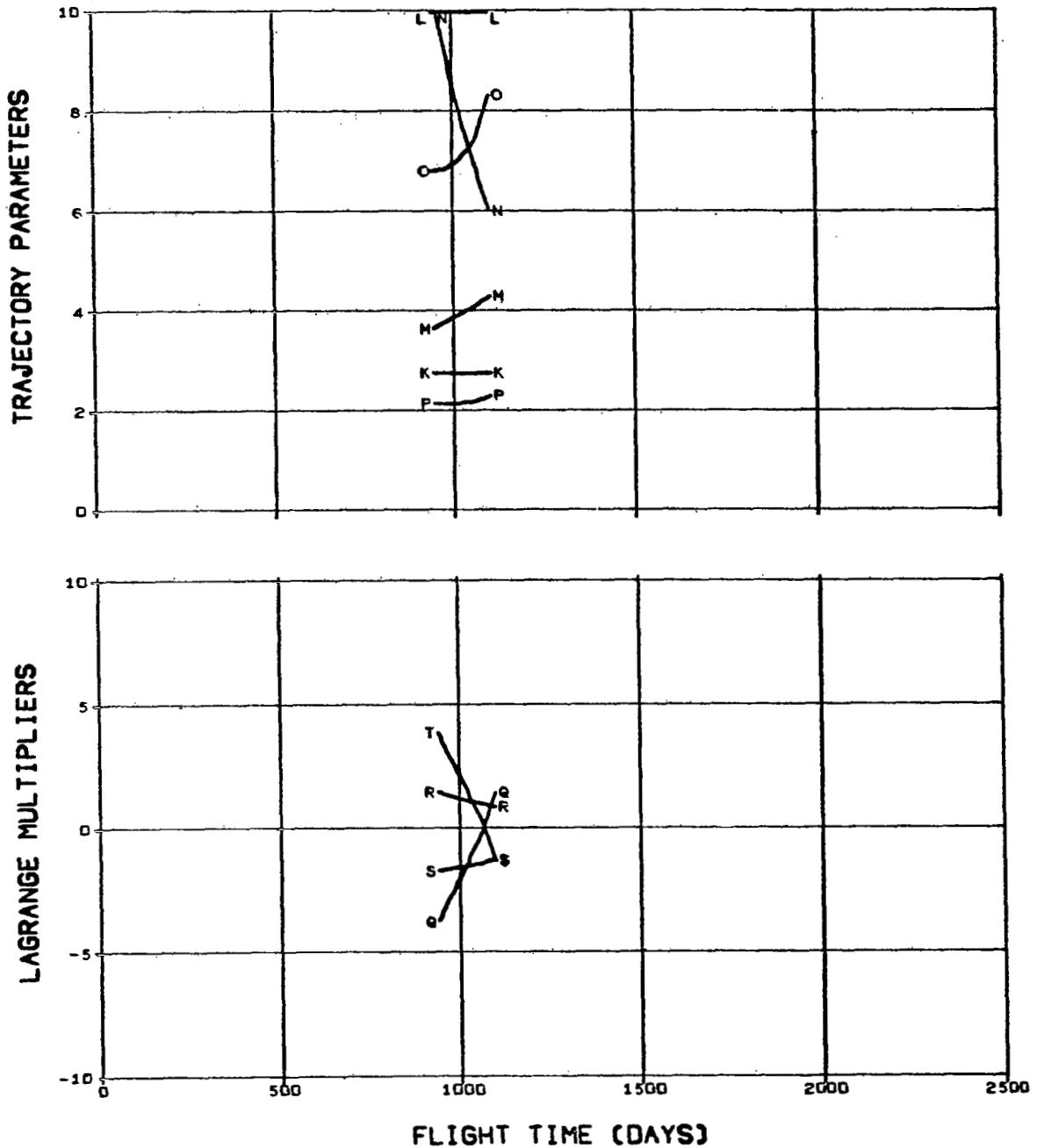


FIG. 4.5.6 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/10000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/100
 G MAXIMUM POWER (KW)/100
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/100

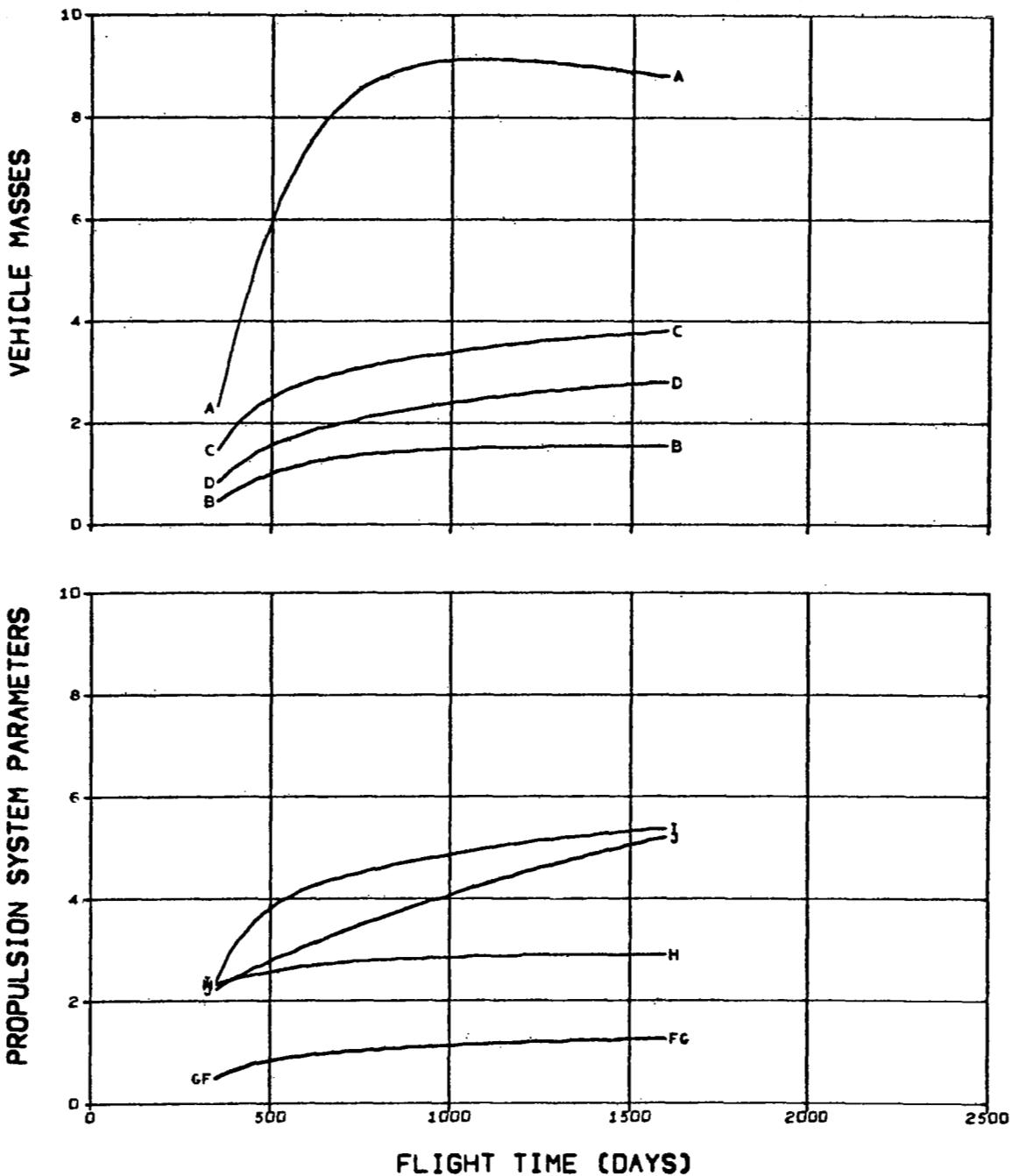


FIG. 5.1.1 JUPITER MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOCENTRIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

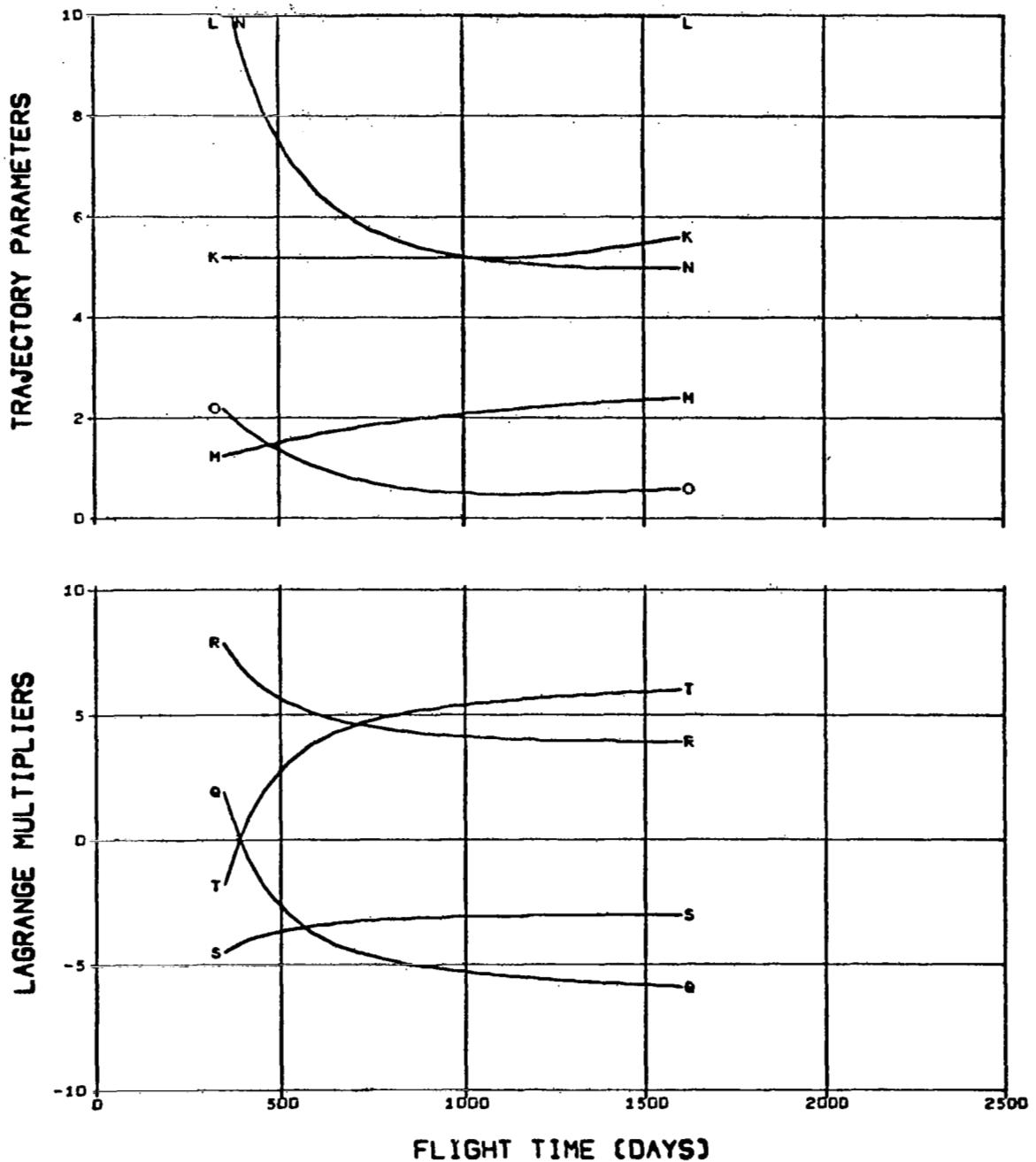


FIG. 5.1.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/1000	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
	J PROPULSION TIME (DAYS)/100

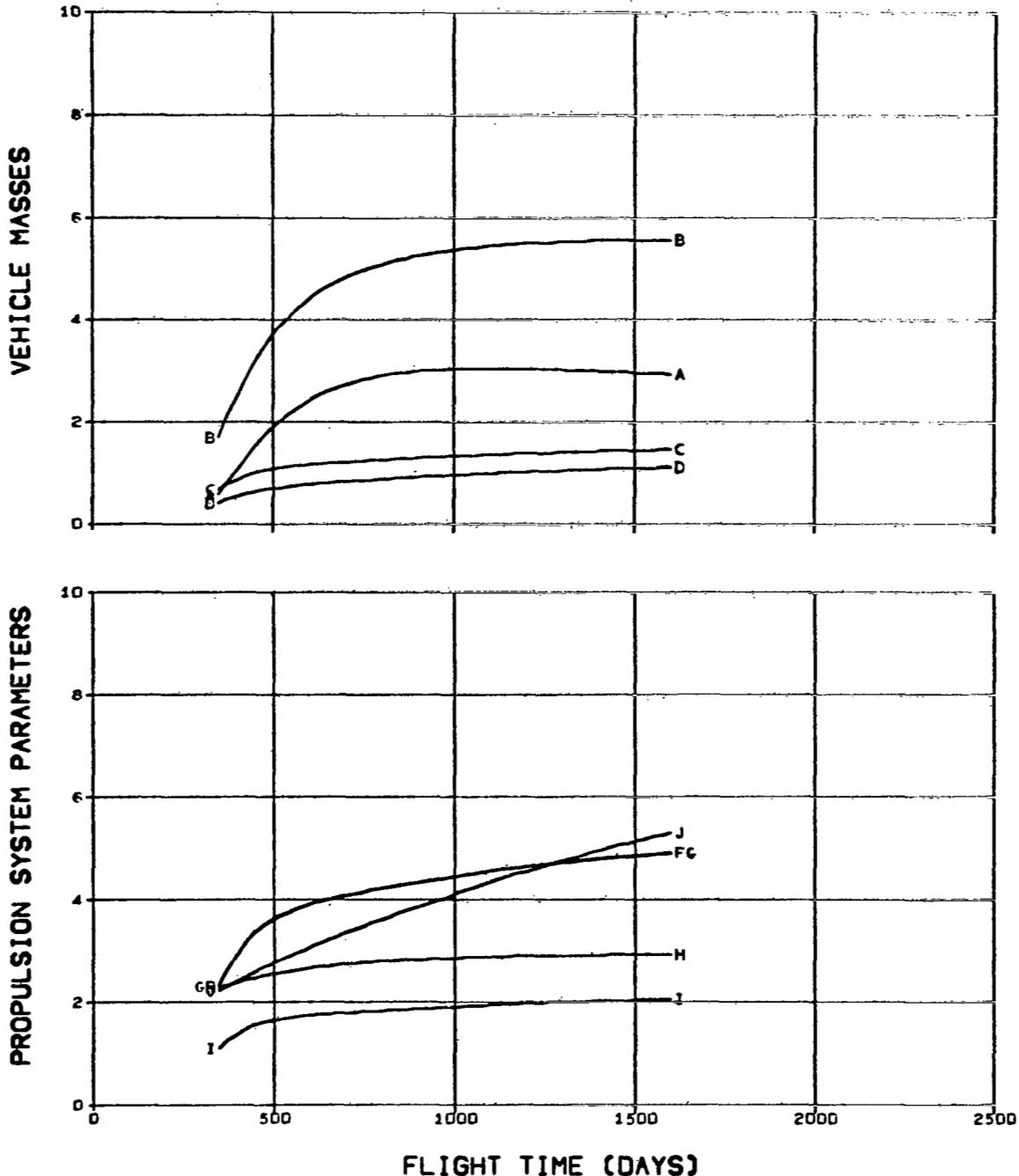


FIG. 5.1.2 JUPITER MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

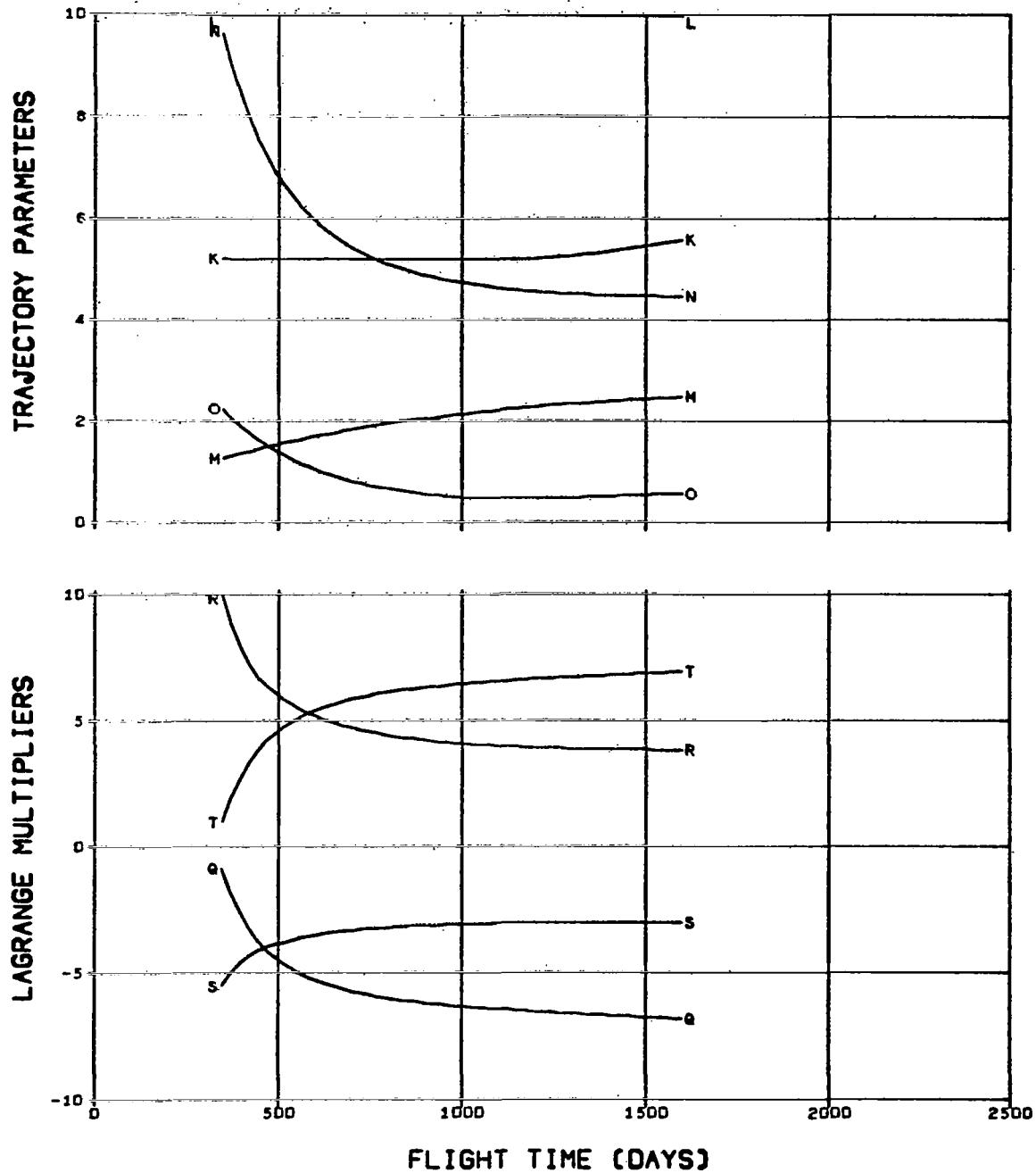


FIG. 5.1.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/100

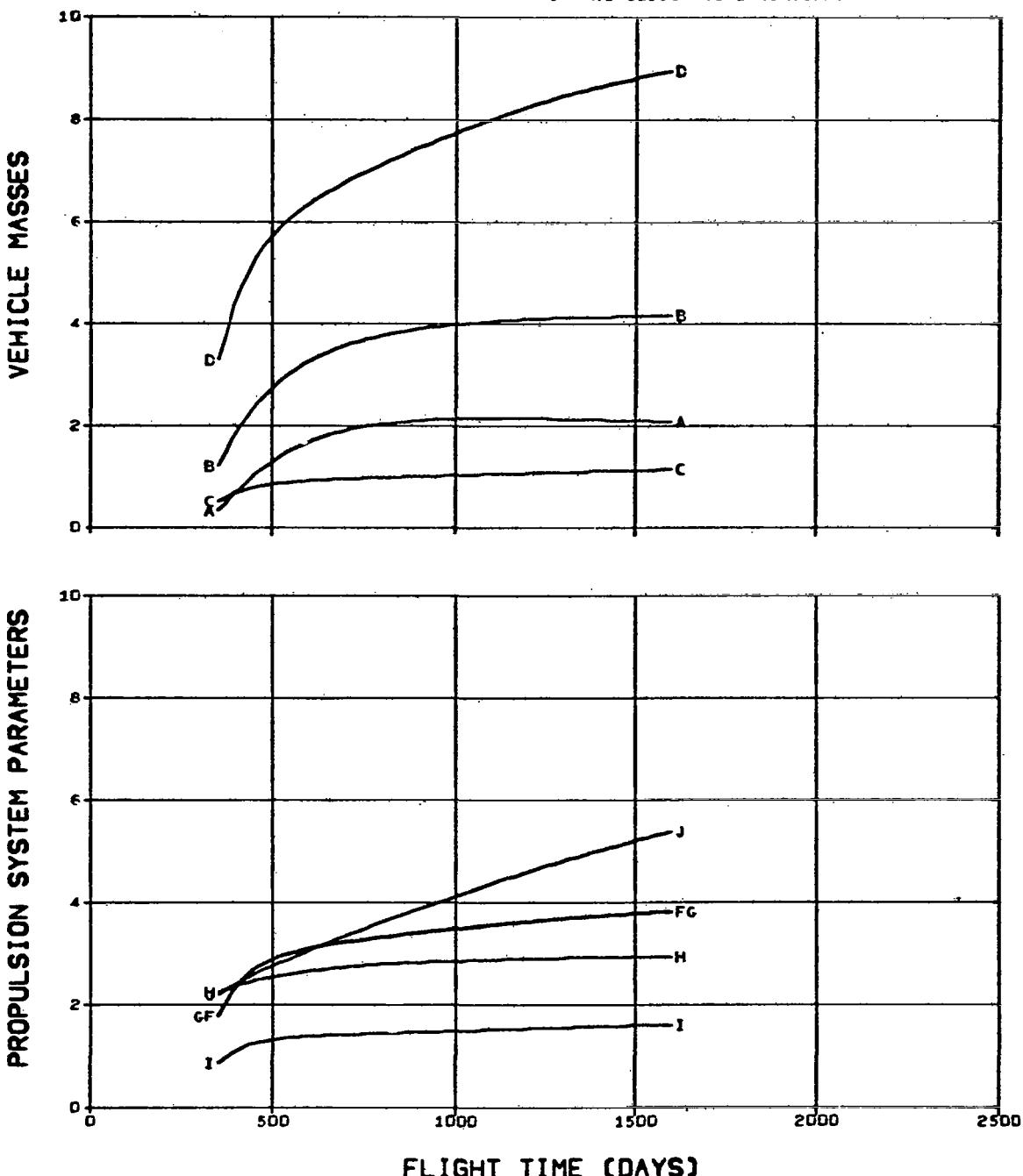


FIG. 5.1.3 JUPITER MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.00E-1
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER/10
H	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

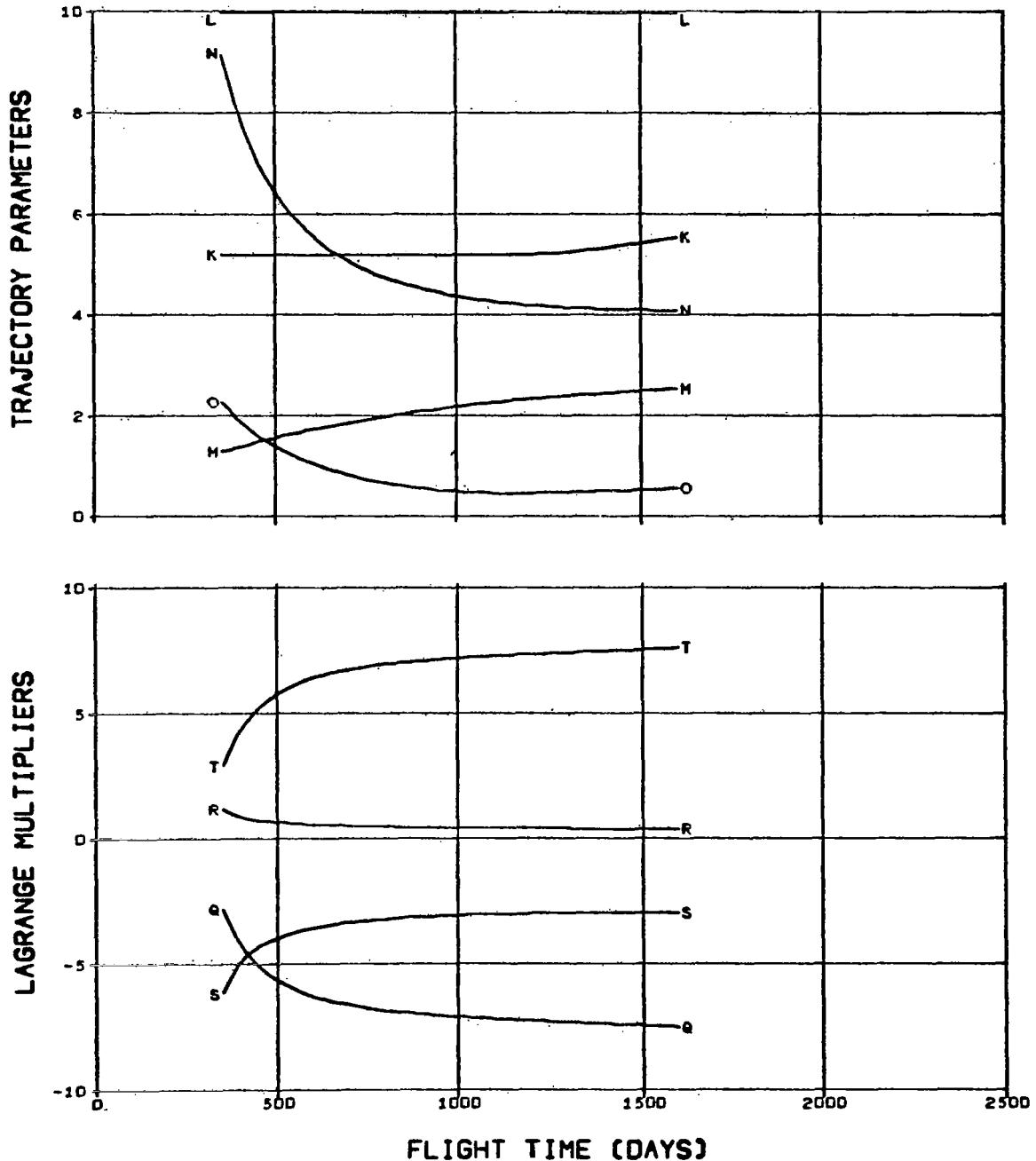


FIG. 5.1.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.0DE-1
	J PROPULSION TIME (DAYS)/100

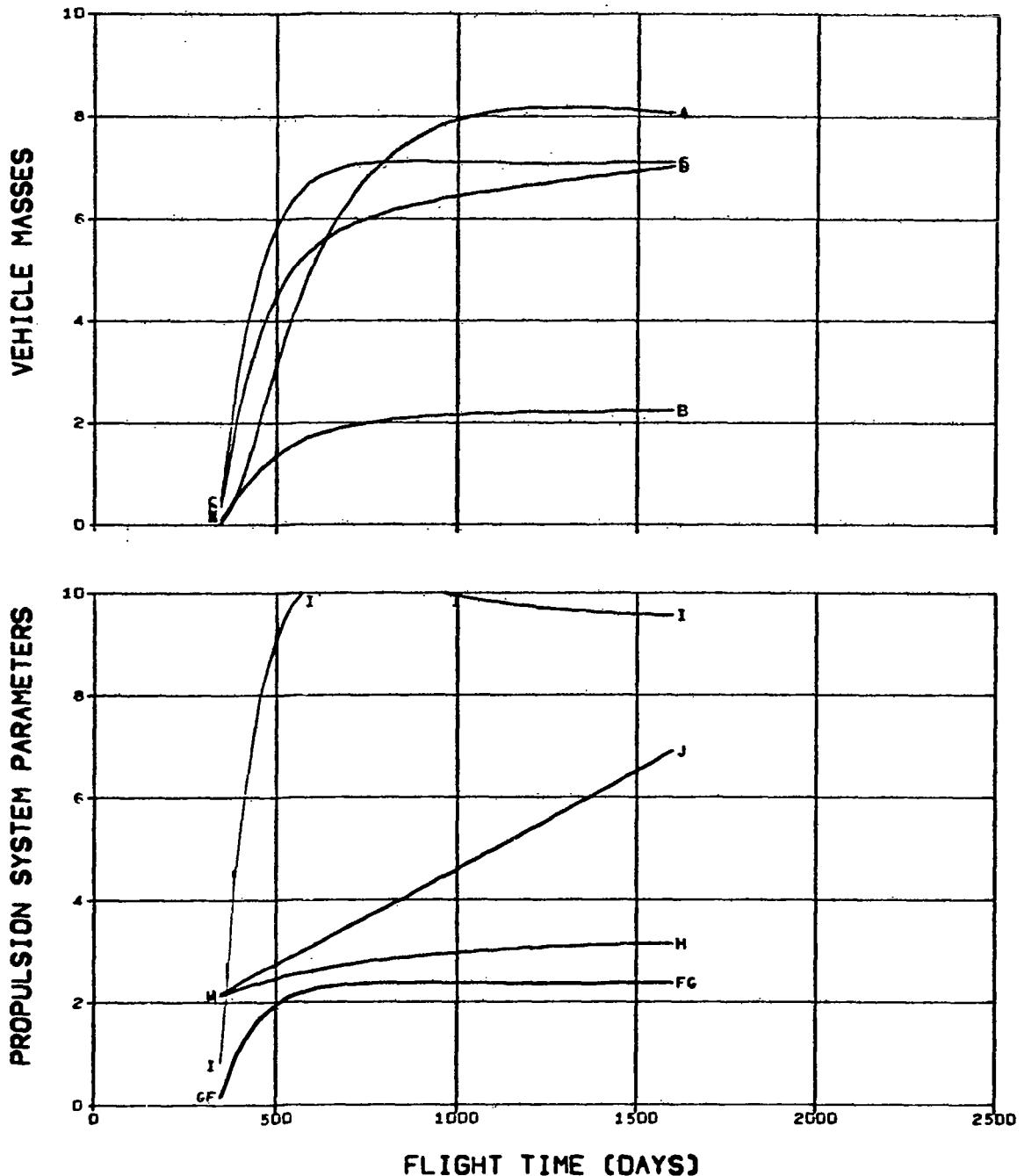


FIG. 5.1.4 JUPITER MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	R	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	Y-COMPONENT OF PRIMER/10
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE/1D
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1D
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

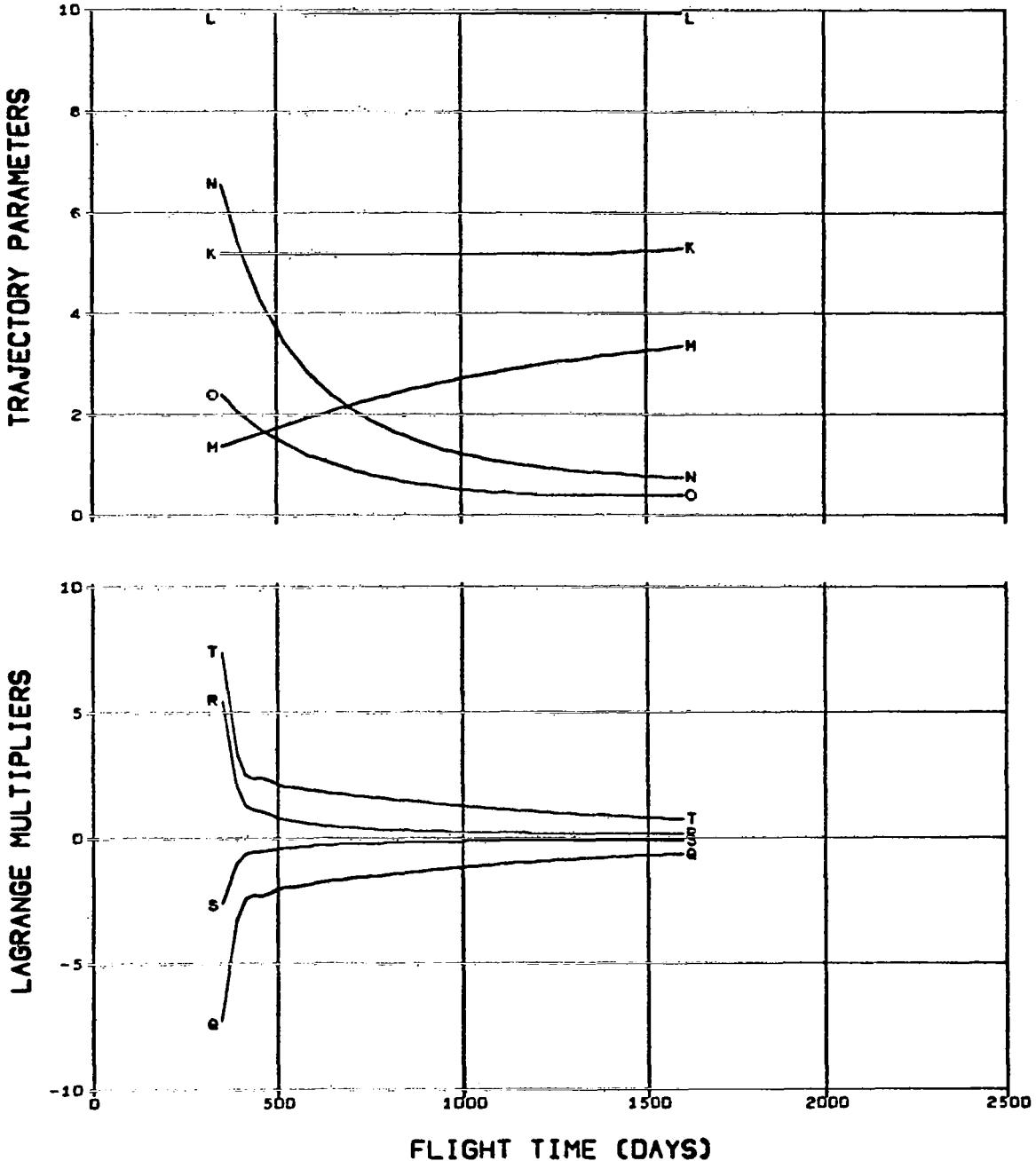


FIG. 5.1.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10.
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.0DE-1
	J PROPULSION TIME (DAYS)/100

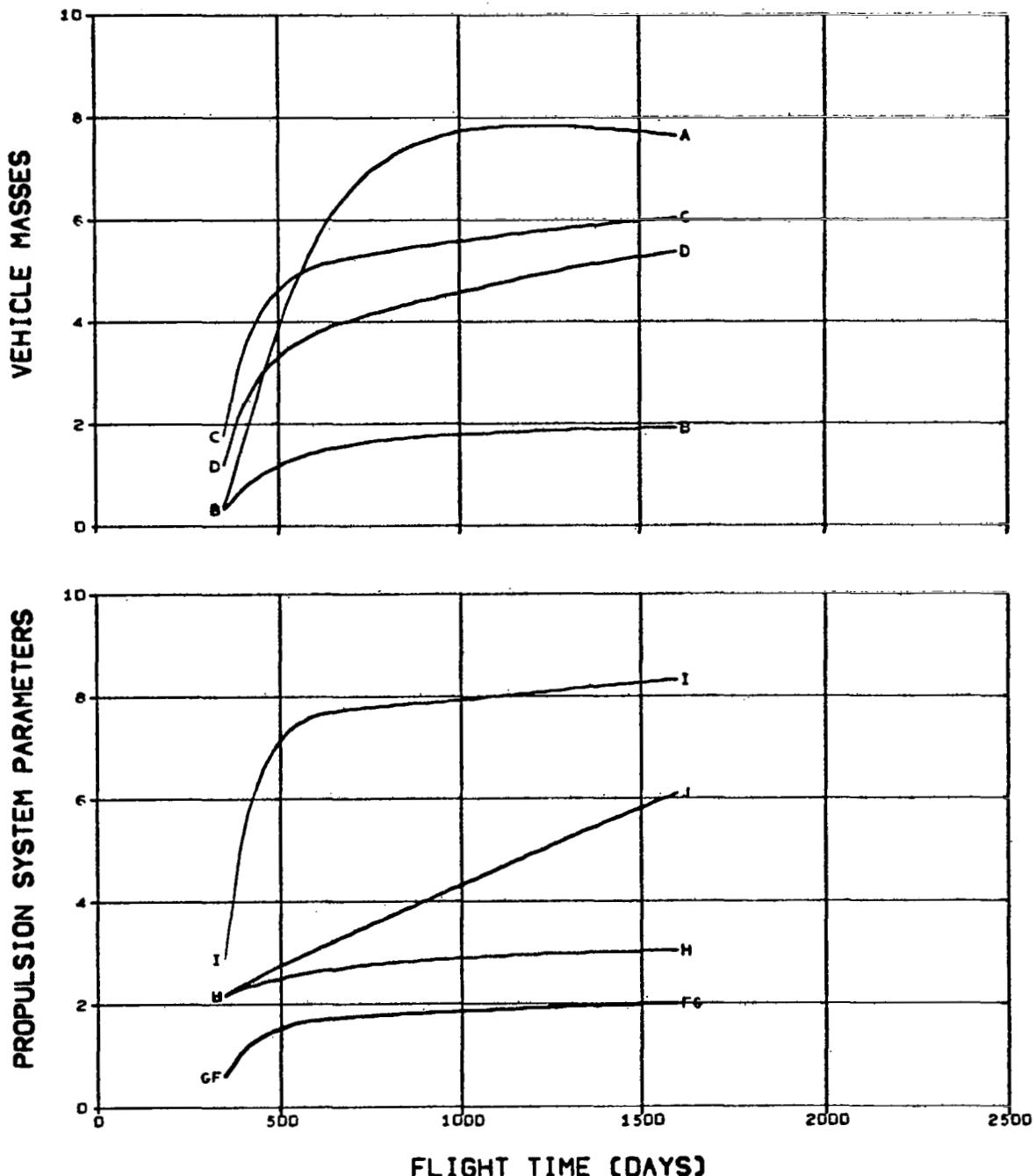


FIG. 5.1.5 JUPITER MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

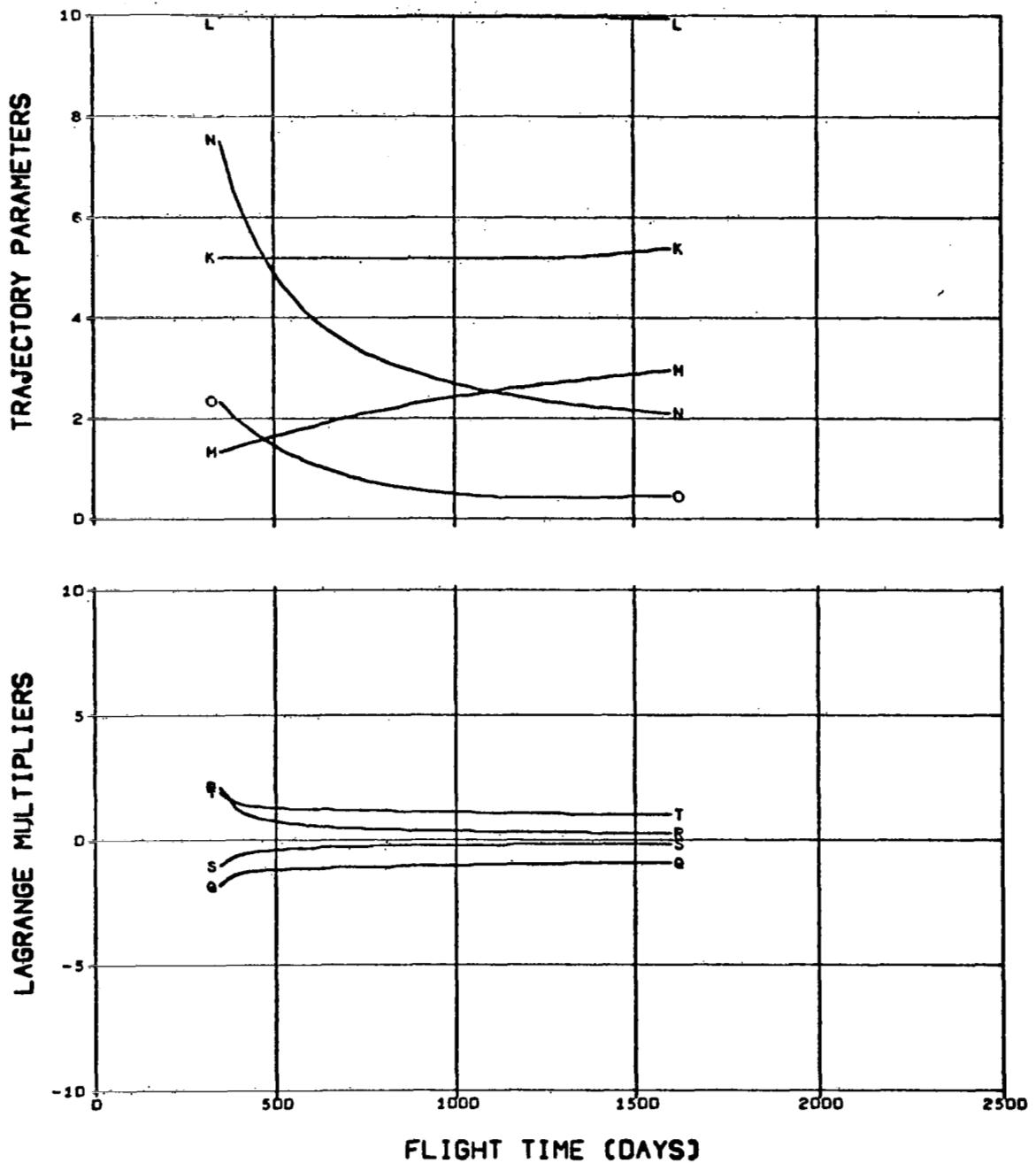


FIG. 5.1.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPELLUTION TIME (DAYS)/100

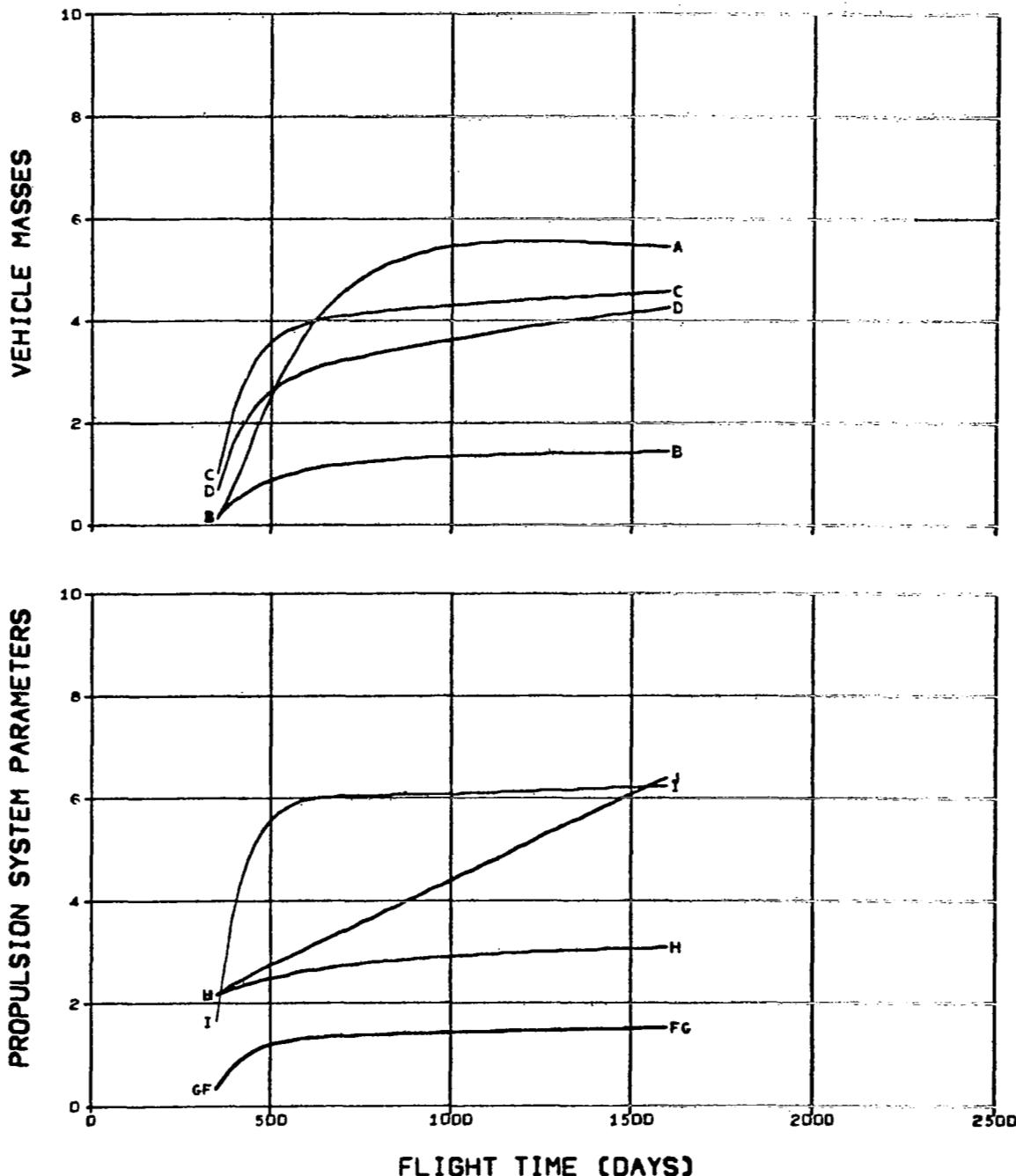


FIG. 5.1.6 JUPITER MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

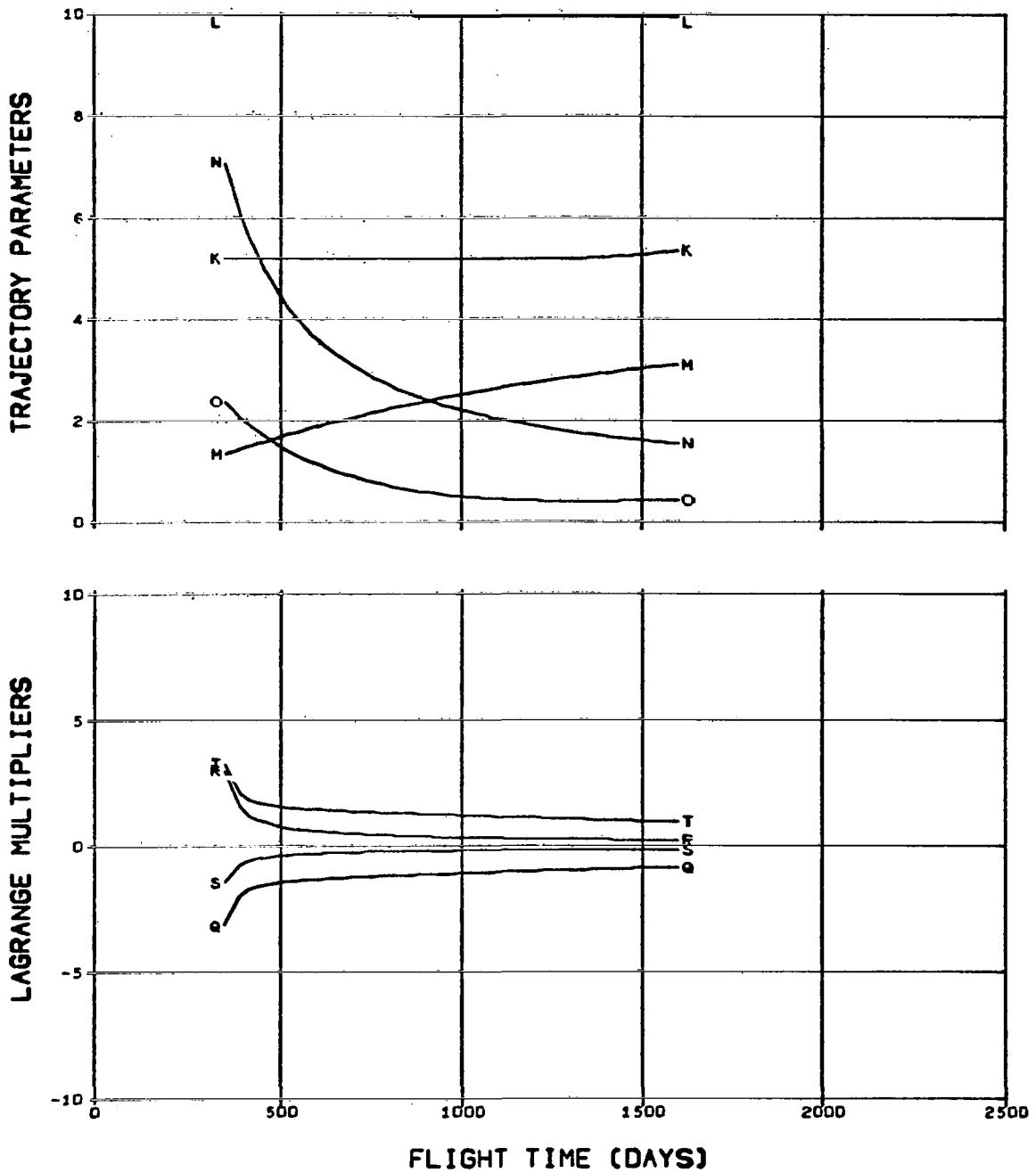


FIG. 5.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/100

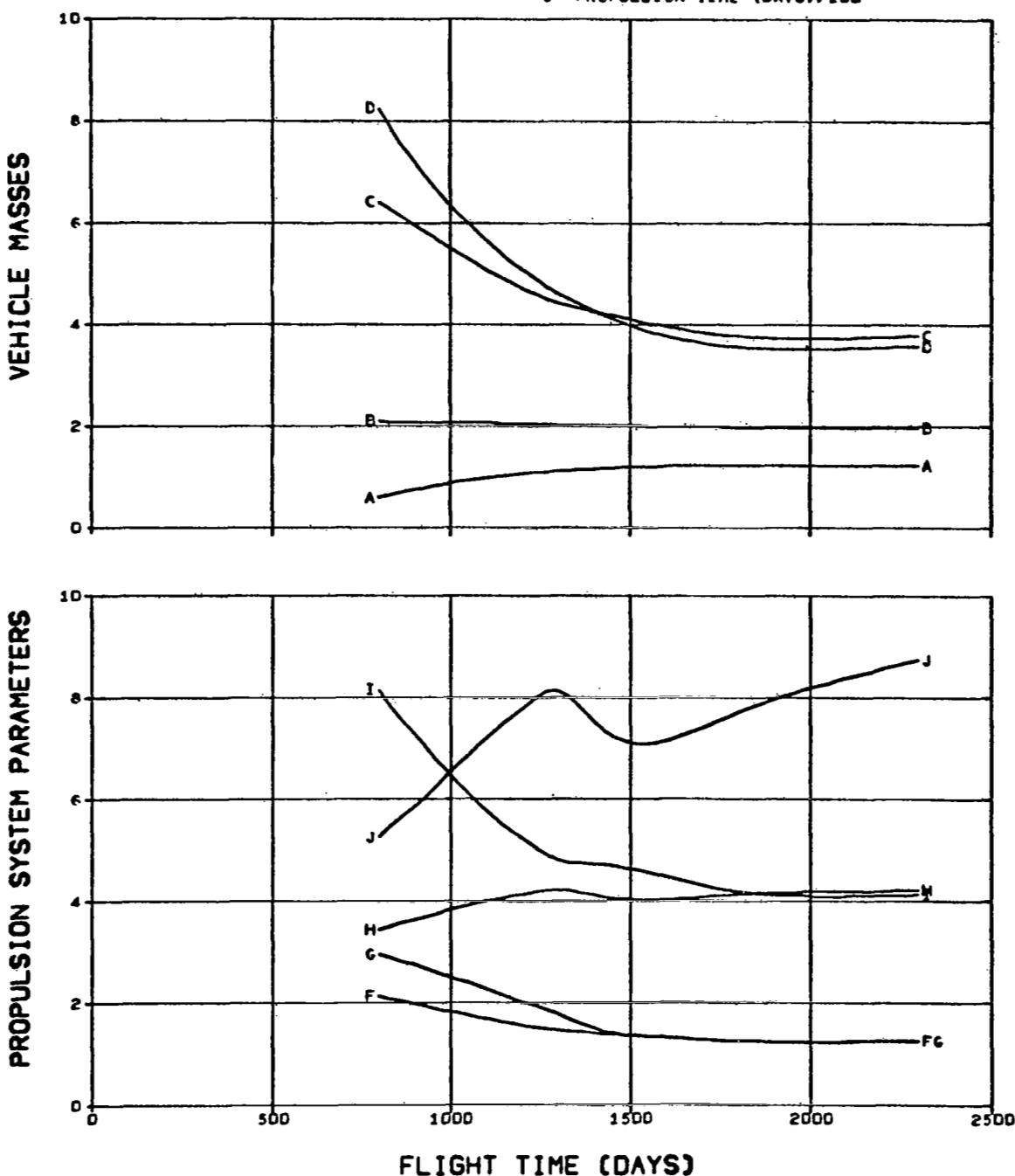


FIG. 5.2.1 JUPITER MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
H	HELIOPCENTRIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

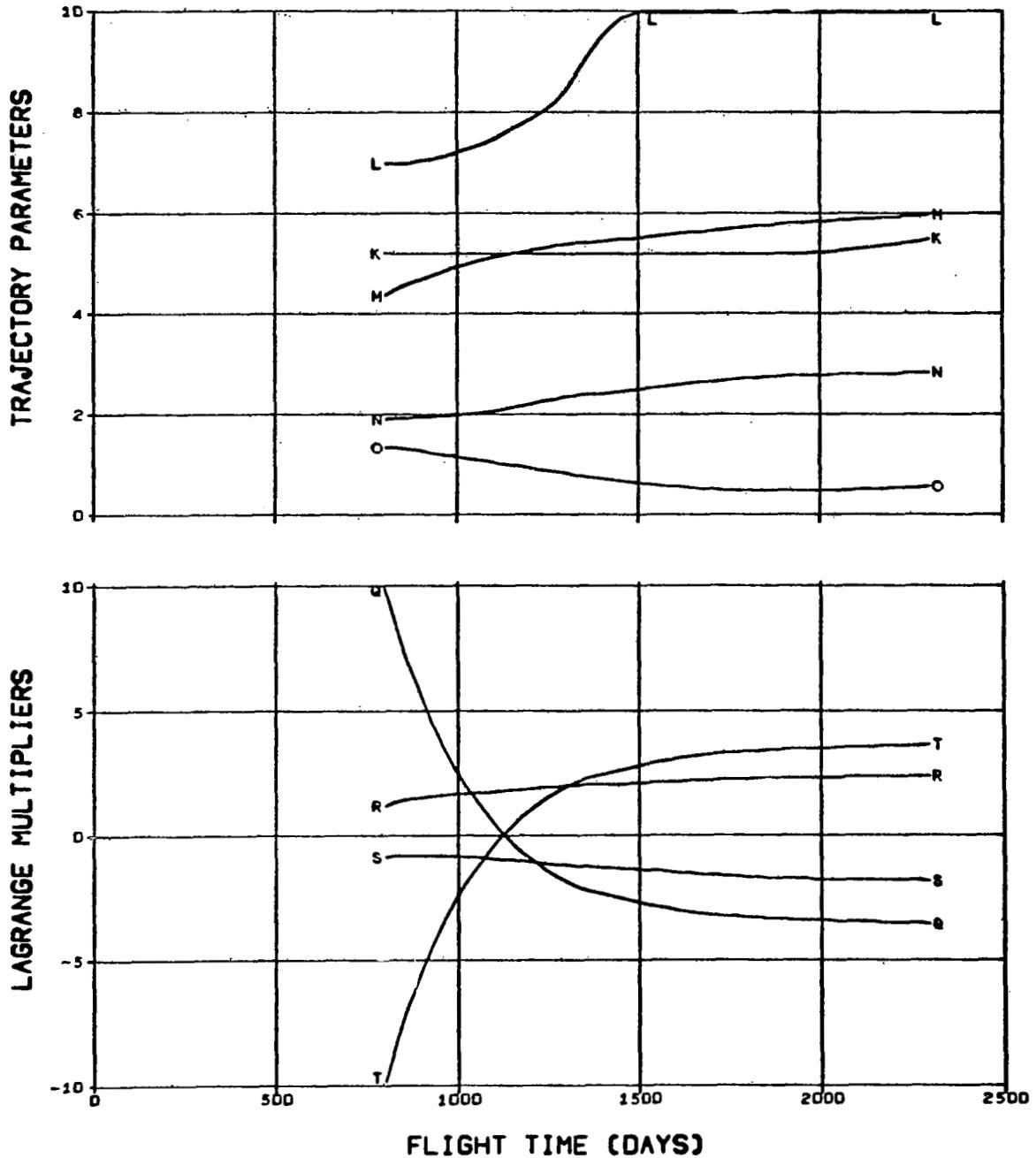


FIG. 5.2.1 (CONCLUDED)

A. NET SPACECRAFT MASS (KG)/1000	F. POWER AT 1 AU (KW)/10
B. INITIAL SPACECRAFT MASS (KG)/1000	G. MAXIMUM POWER (KW)/10
C. PROPULSION SYSTEM MASS (KG)/1000	H. JET EXHAUST SPEED (M/SEC)/10000
D. PROPELLANT MASS (KG)/1000	I. THRUST AT 1 AU (N)
	J. PROPULSION TIME (DAYS)/100

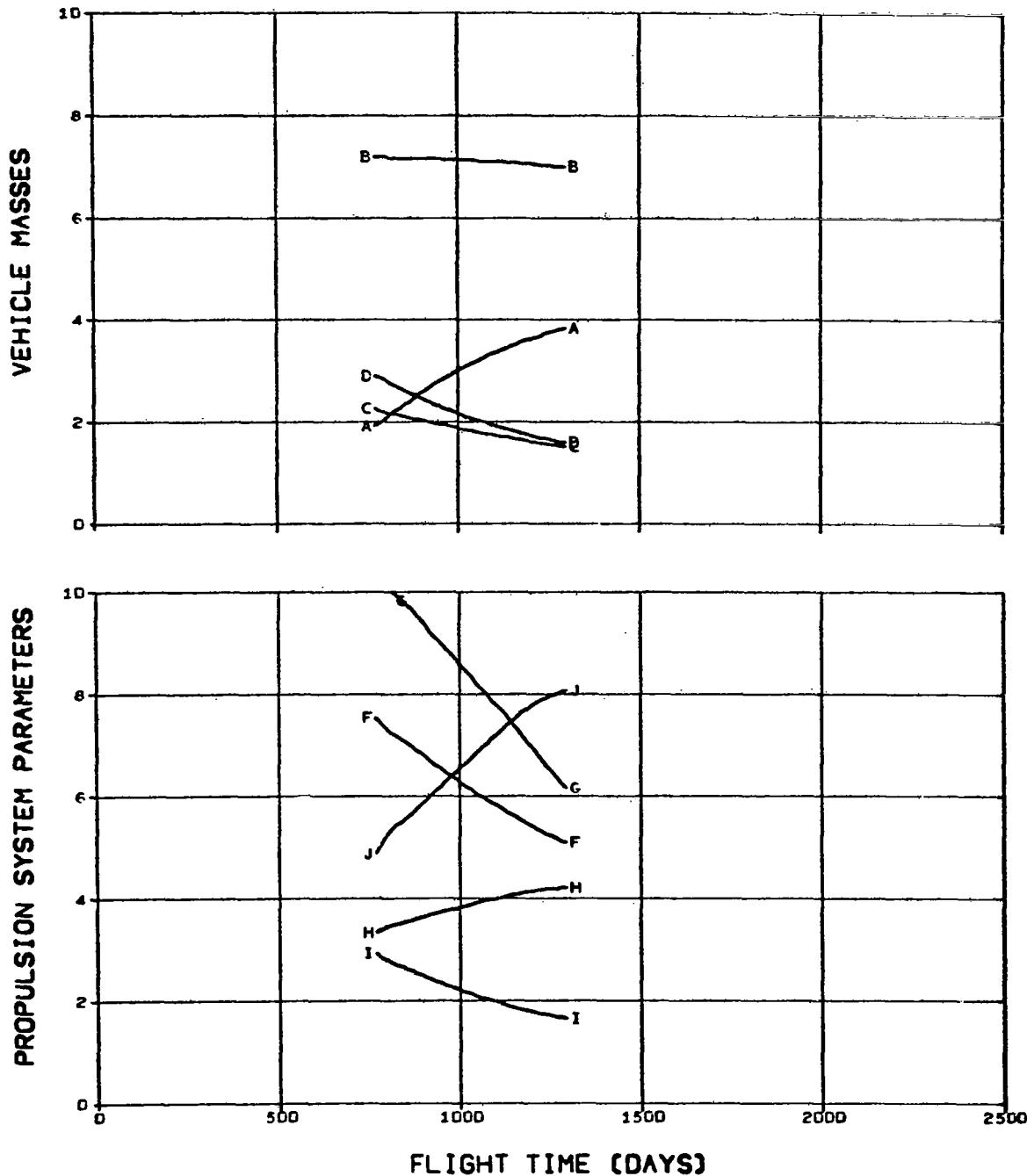


FIG. 5.2.2 JUPITER MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

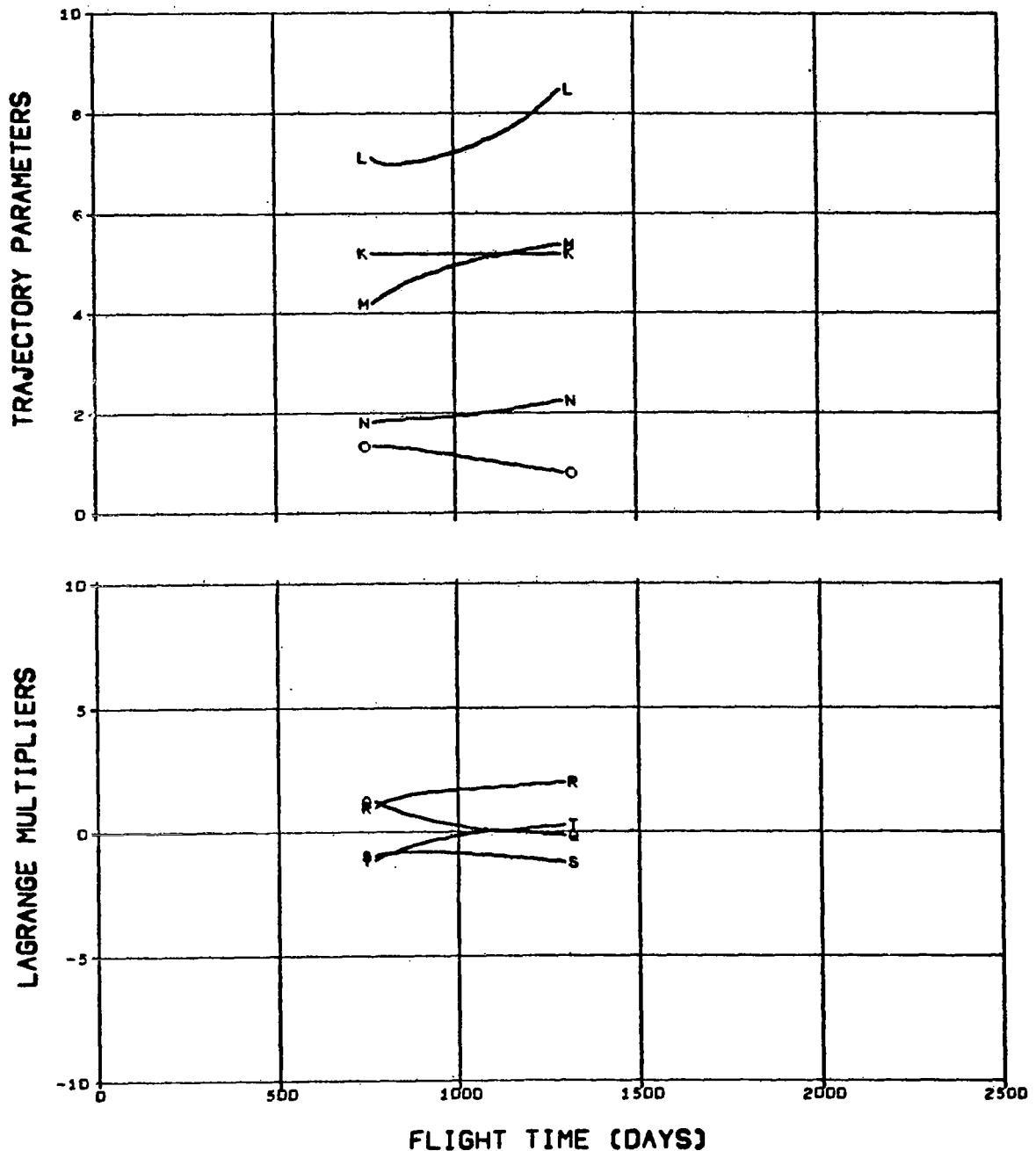


FIG. 5.2.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

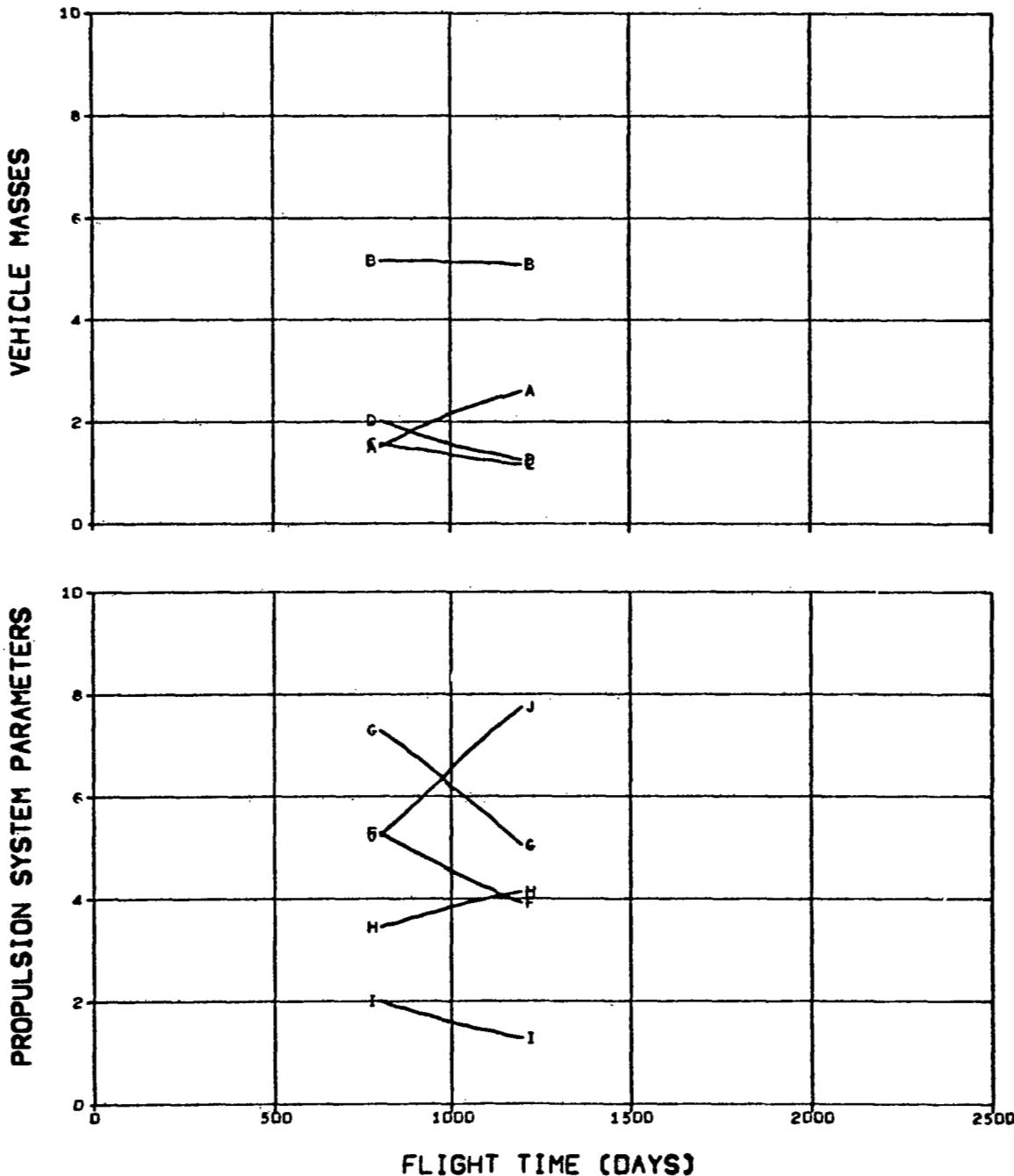


FIG. 5.2.3 JUPITER MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

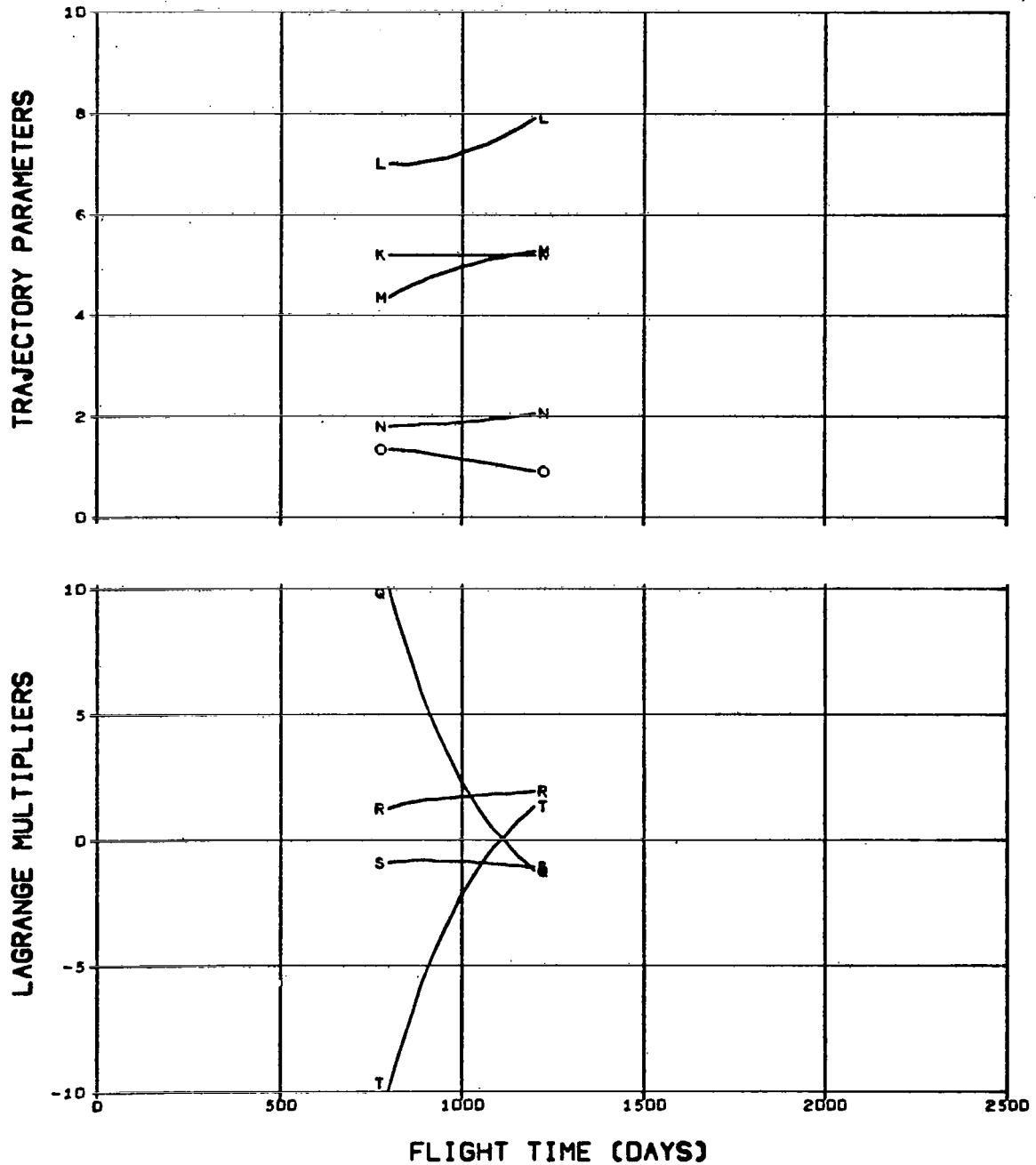


FIG. 5.2.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPULSION TIME (DAYS)/100

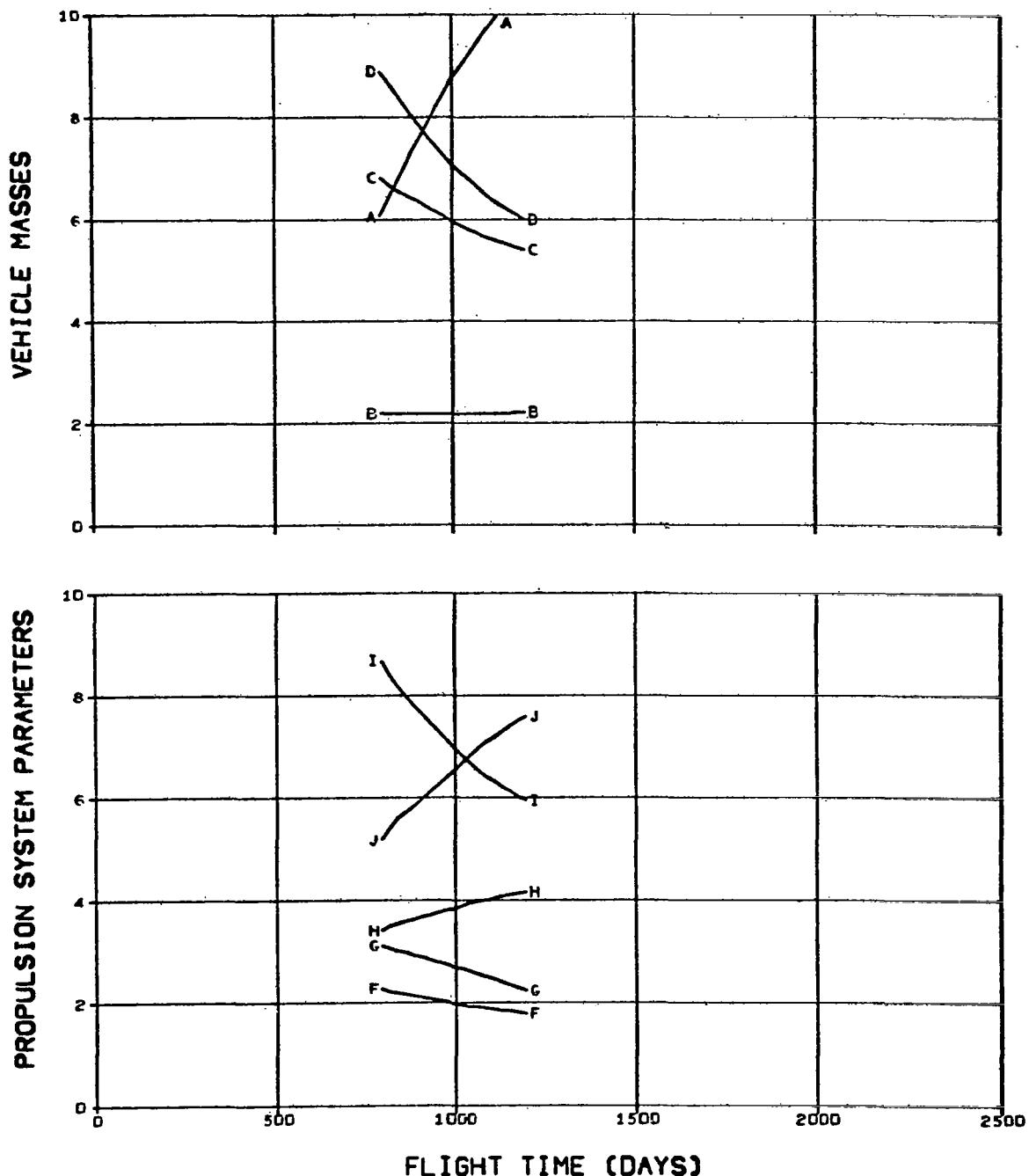


FIG. 5.2.4 JUPITER MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 H HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

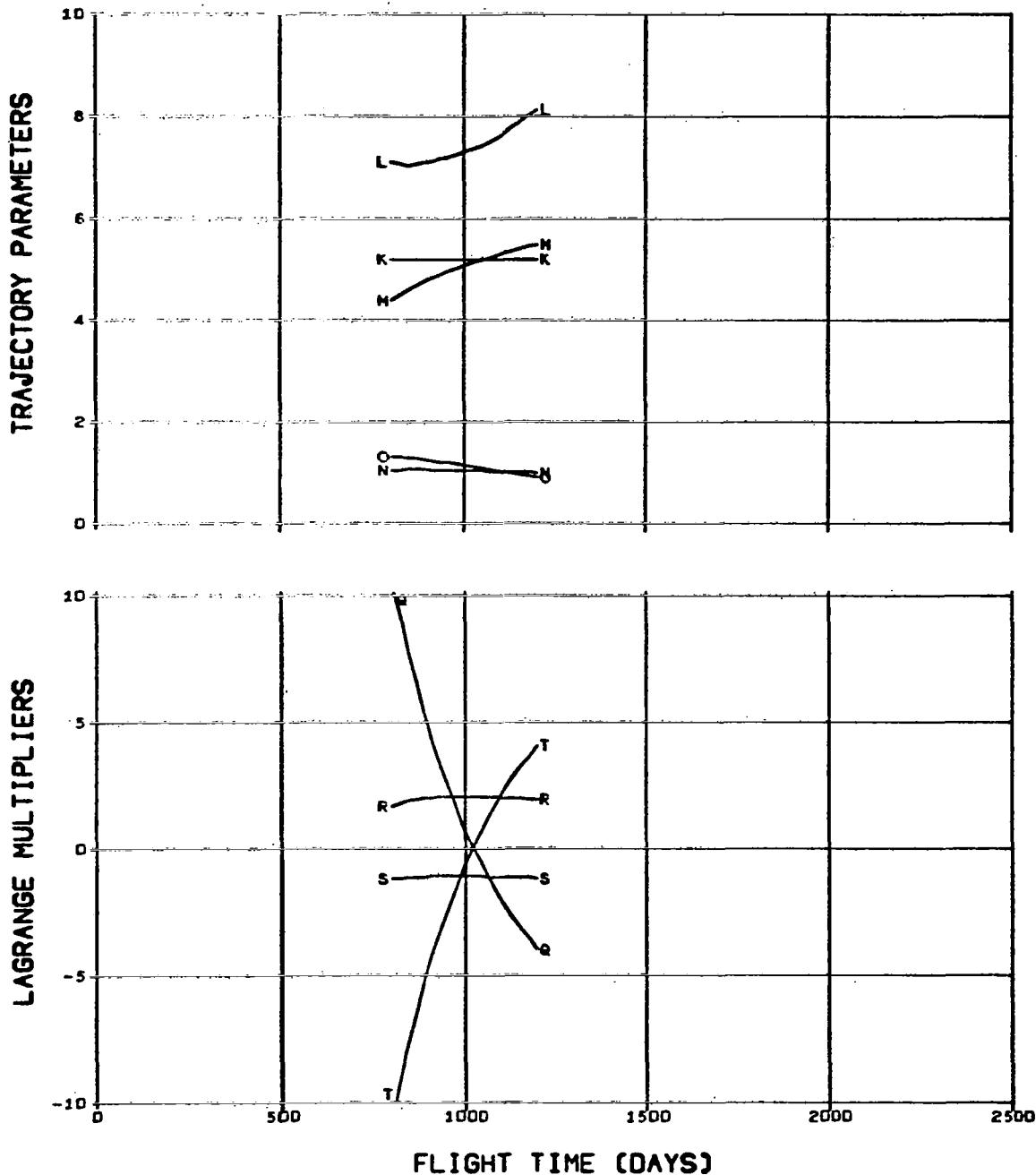


FIG. 5.2.4 (CONCLUDED)

A. NET SPACECRAFT MASS (KG)/100	F. POWER AT 1 AU (KW)/10
B. INITIAL SPACECRAFT MASS (KG)/1000	G. MAXIMUM POWER (KW)/10
C. PROPULSION SYSTEM MASS (KG)/100	H. JET EXHAUST SPEED (M/SEC)/10000
D. PROPELLANT MASS (KG)/100	I. THRUST AT 1 AU (N)/1.00E-1
	J. PROPULSION TIME (DAYS)/100

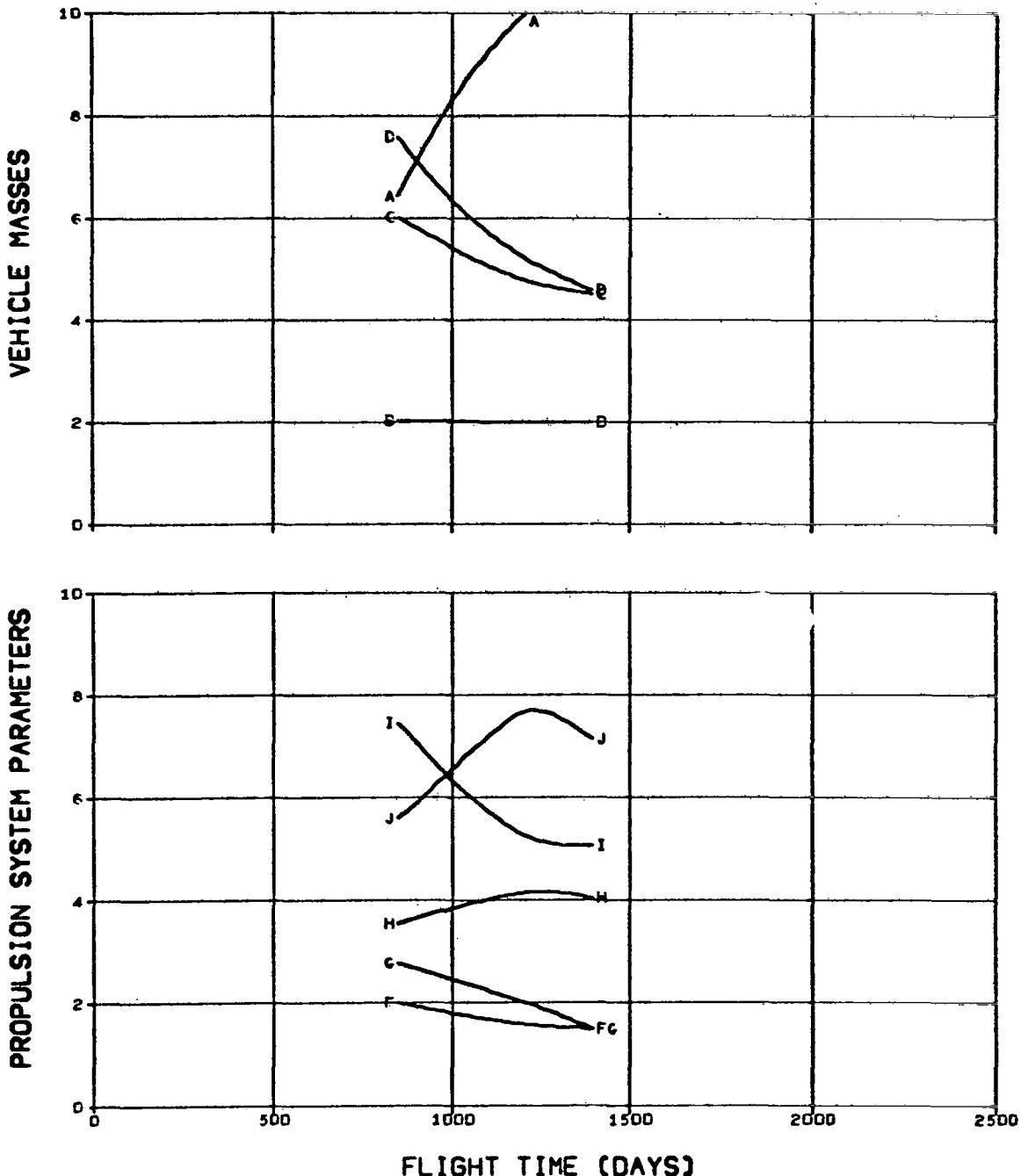


FIG. 5.2.5 JUPITER MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

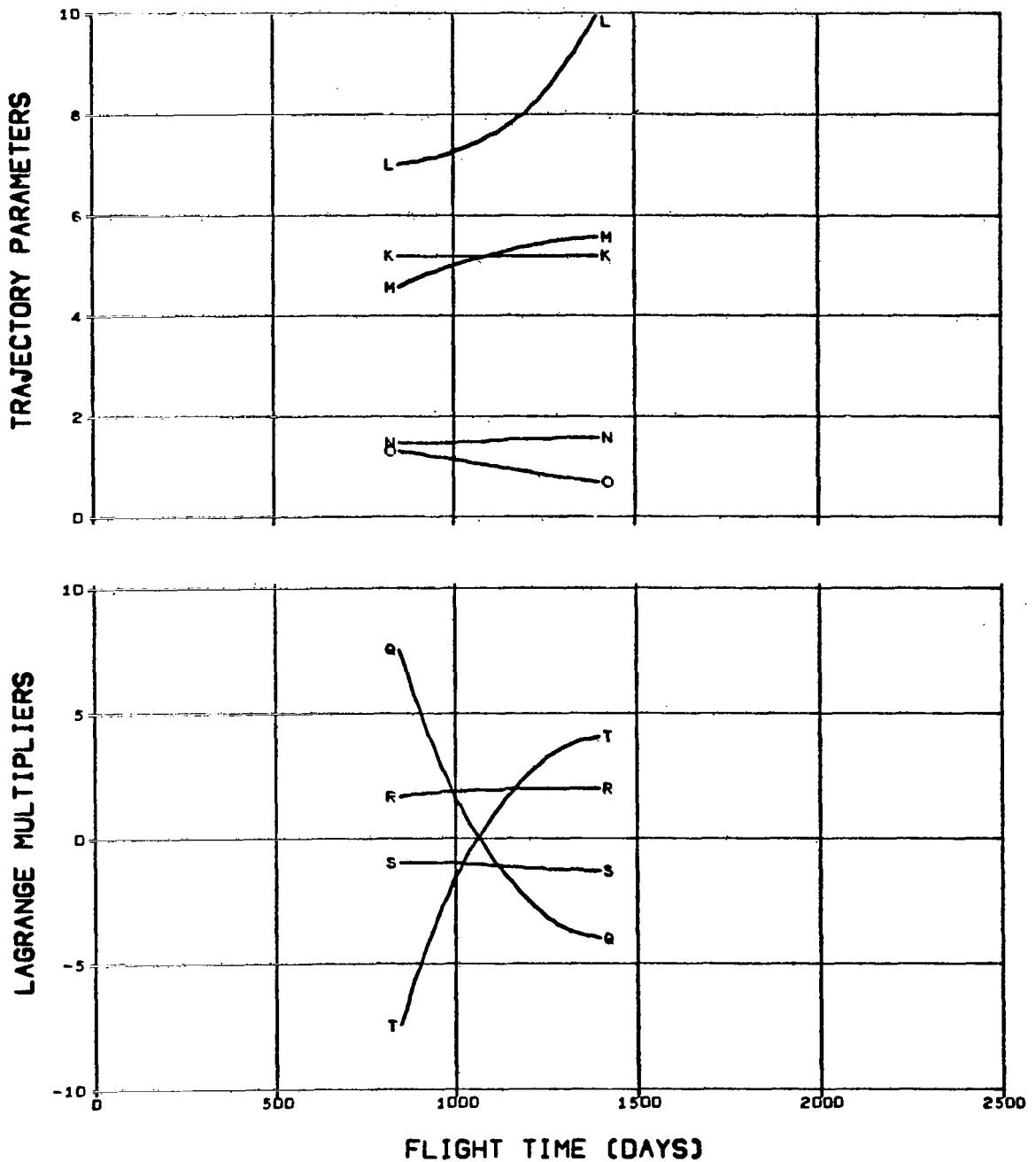


FIG. 5.2.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPELLUTION TIME (DAYS)/100

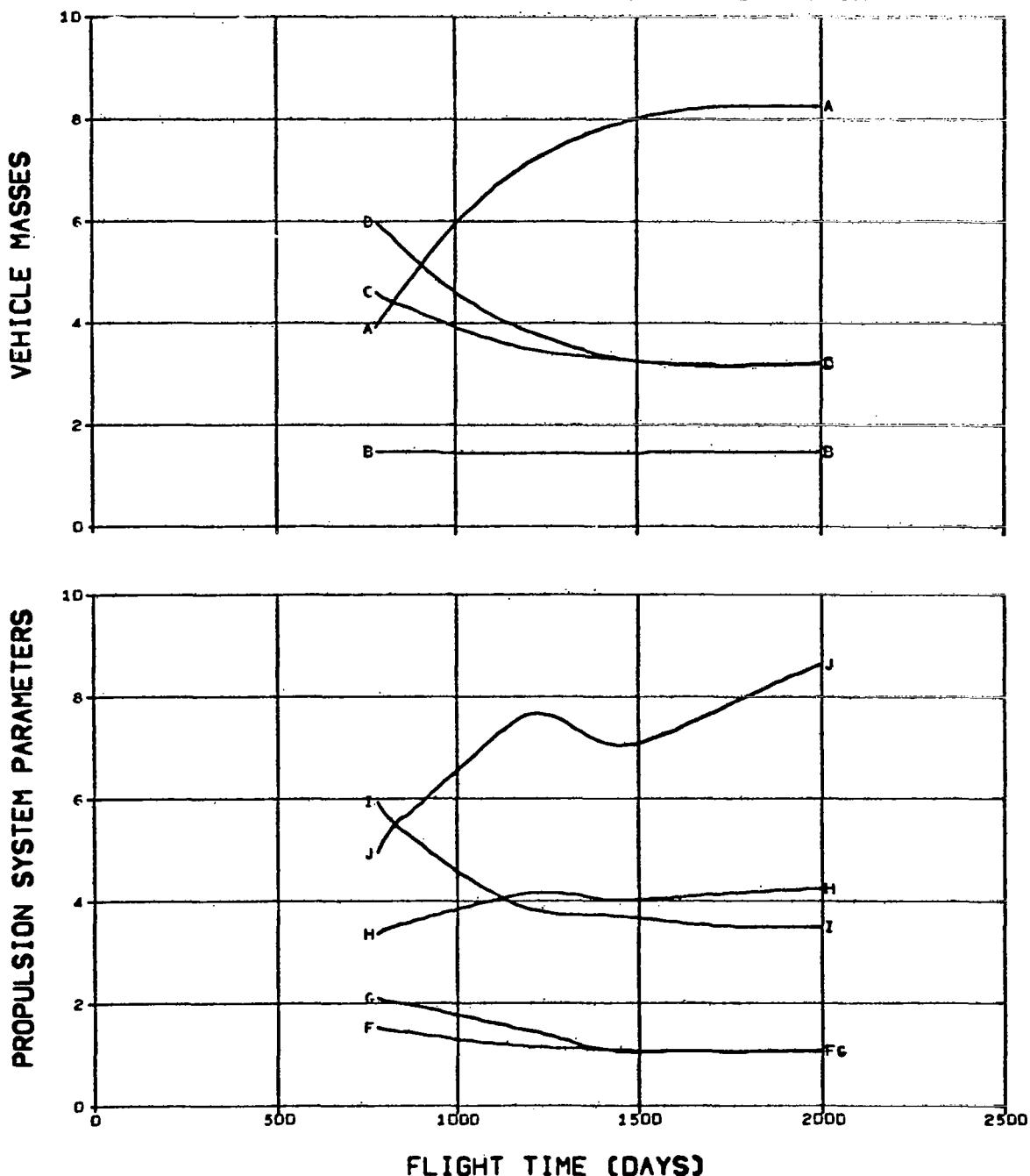


FIG. S.2.6 JUPITER MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

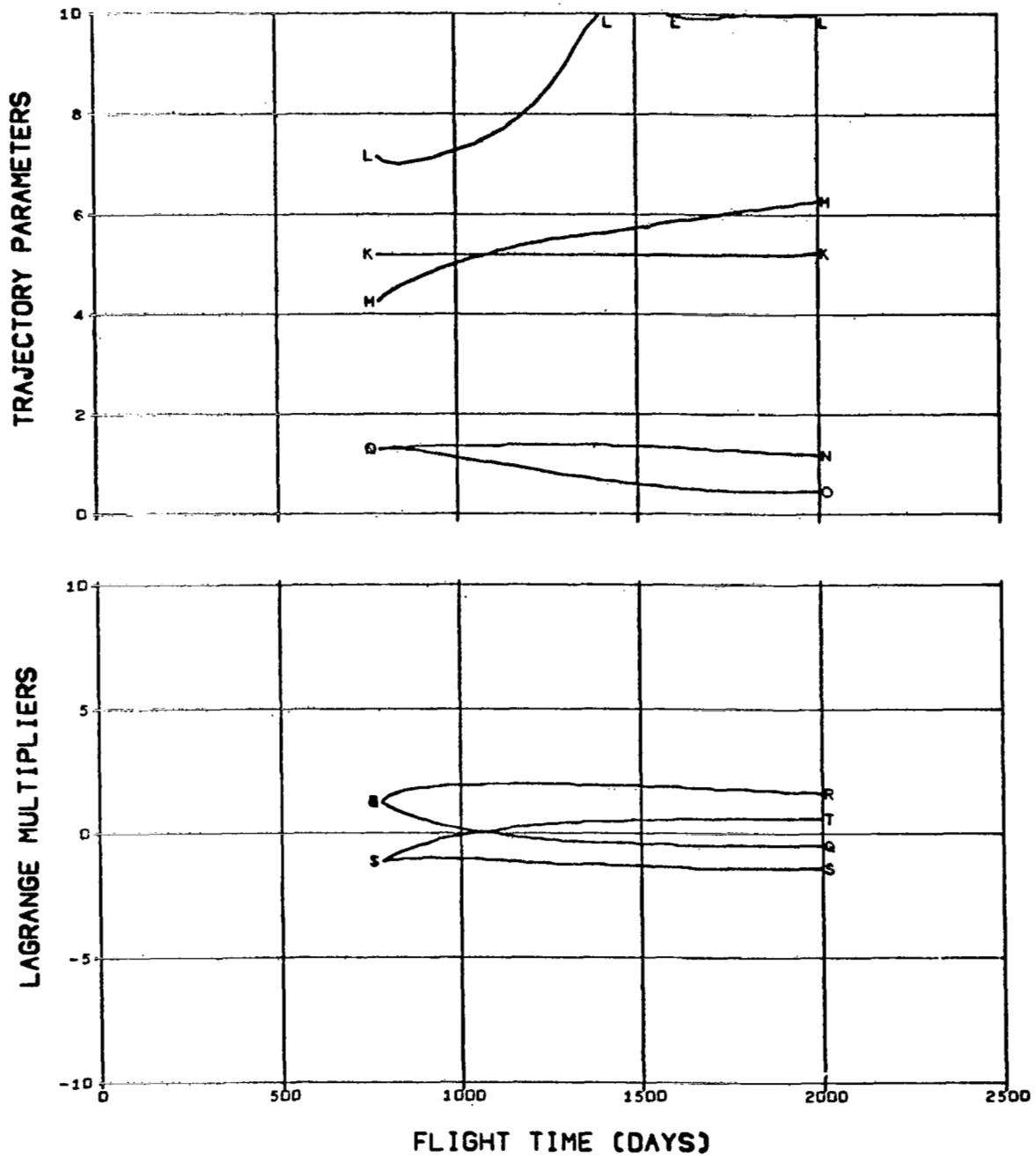


FIG. 5.2.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

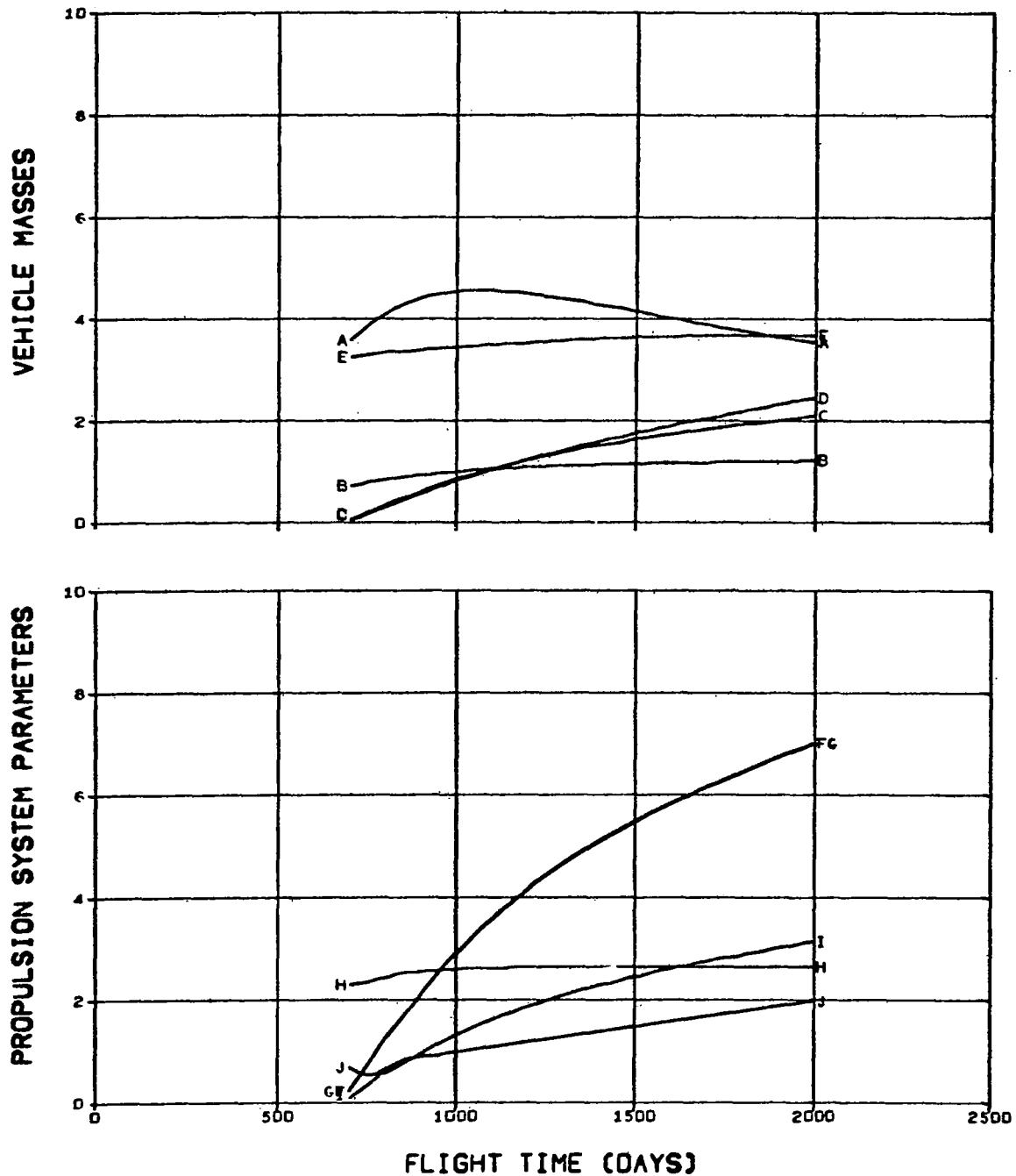


FIG. 5.3.1 JUPITER MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPCENTRIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

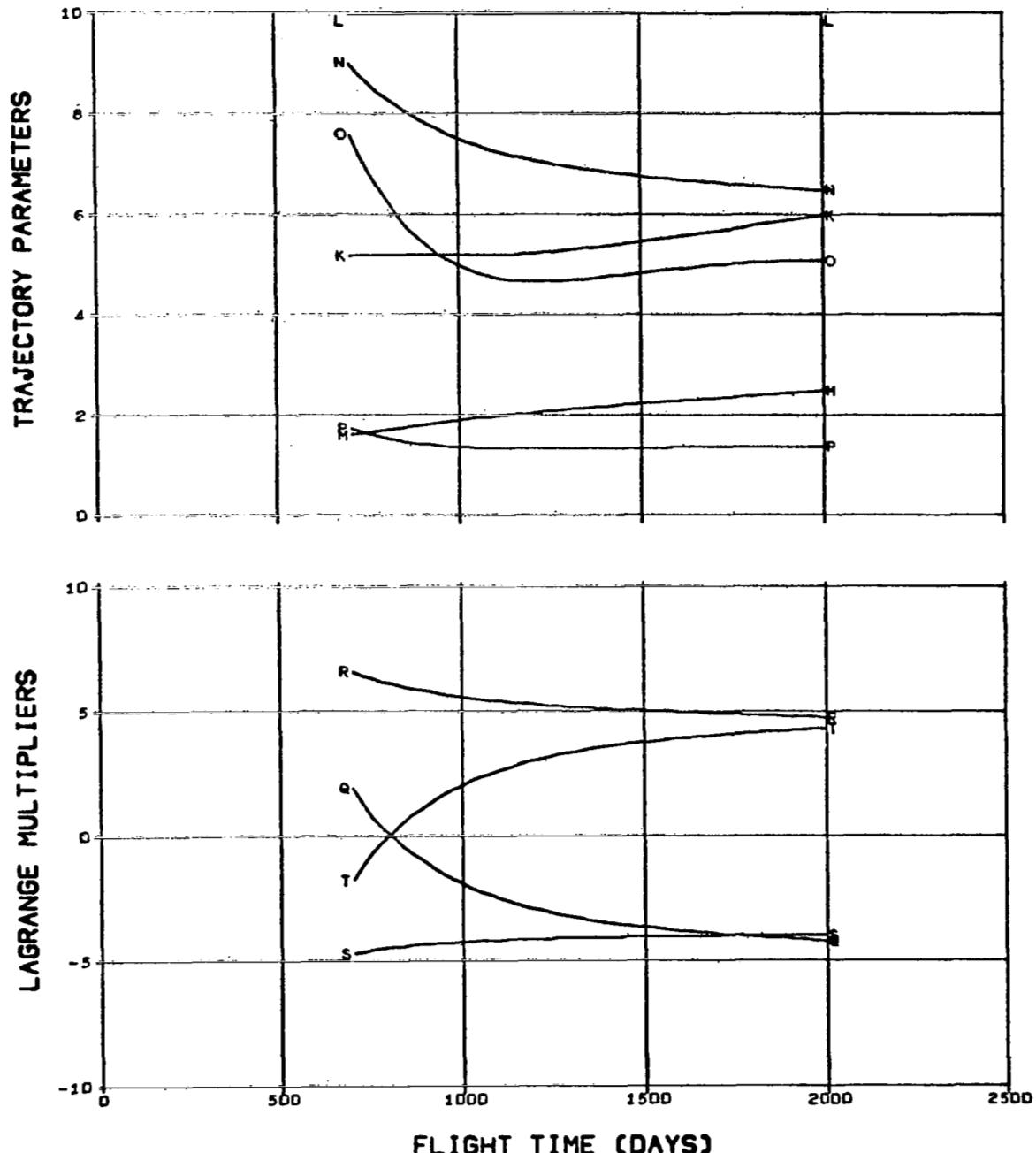
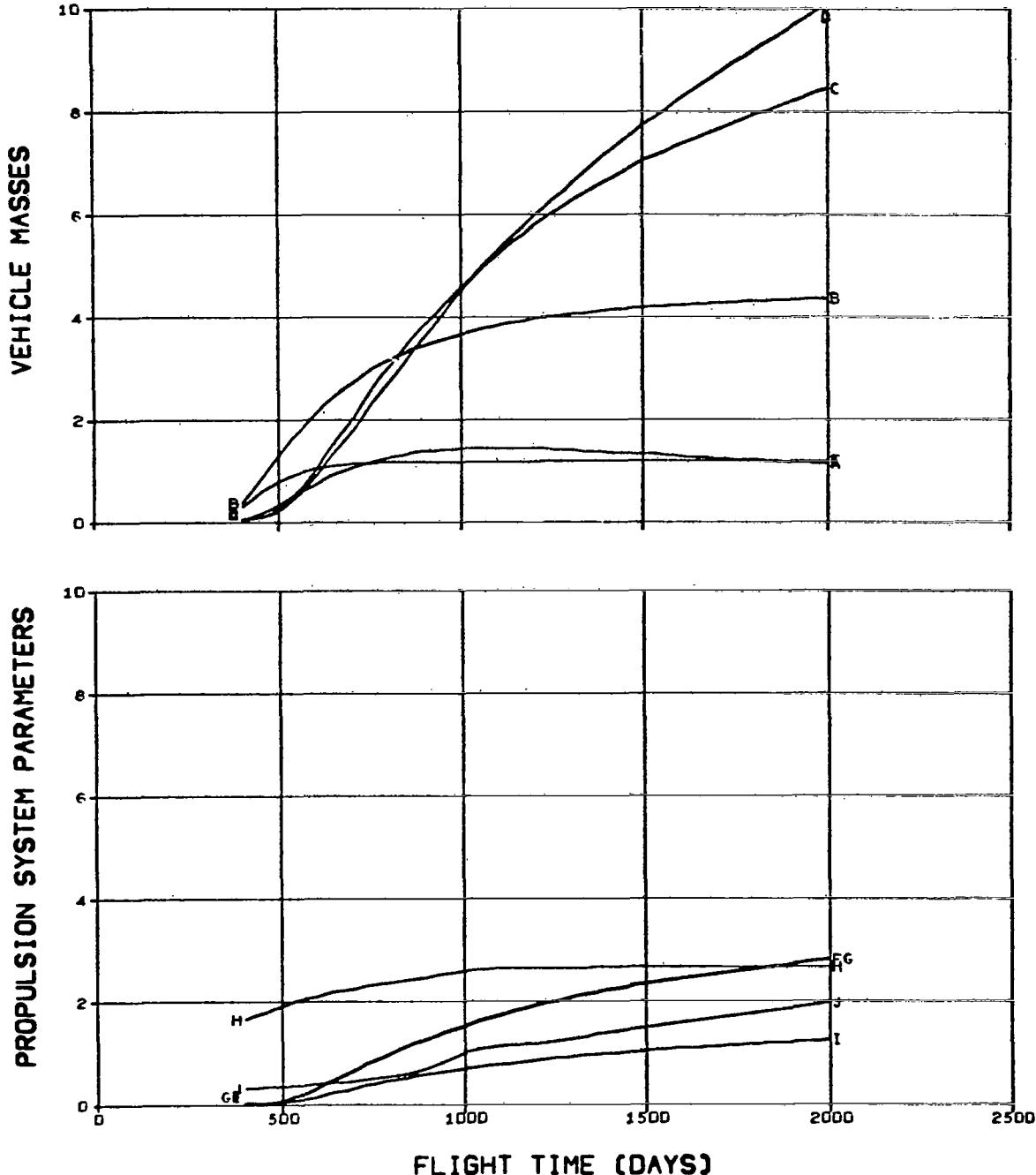


FIG. 5.3.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.3.2 JUPITER MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/10000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

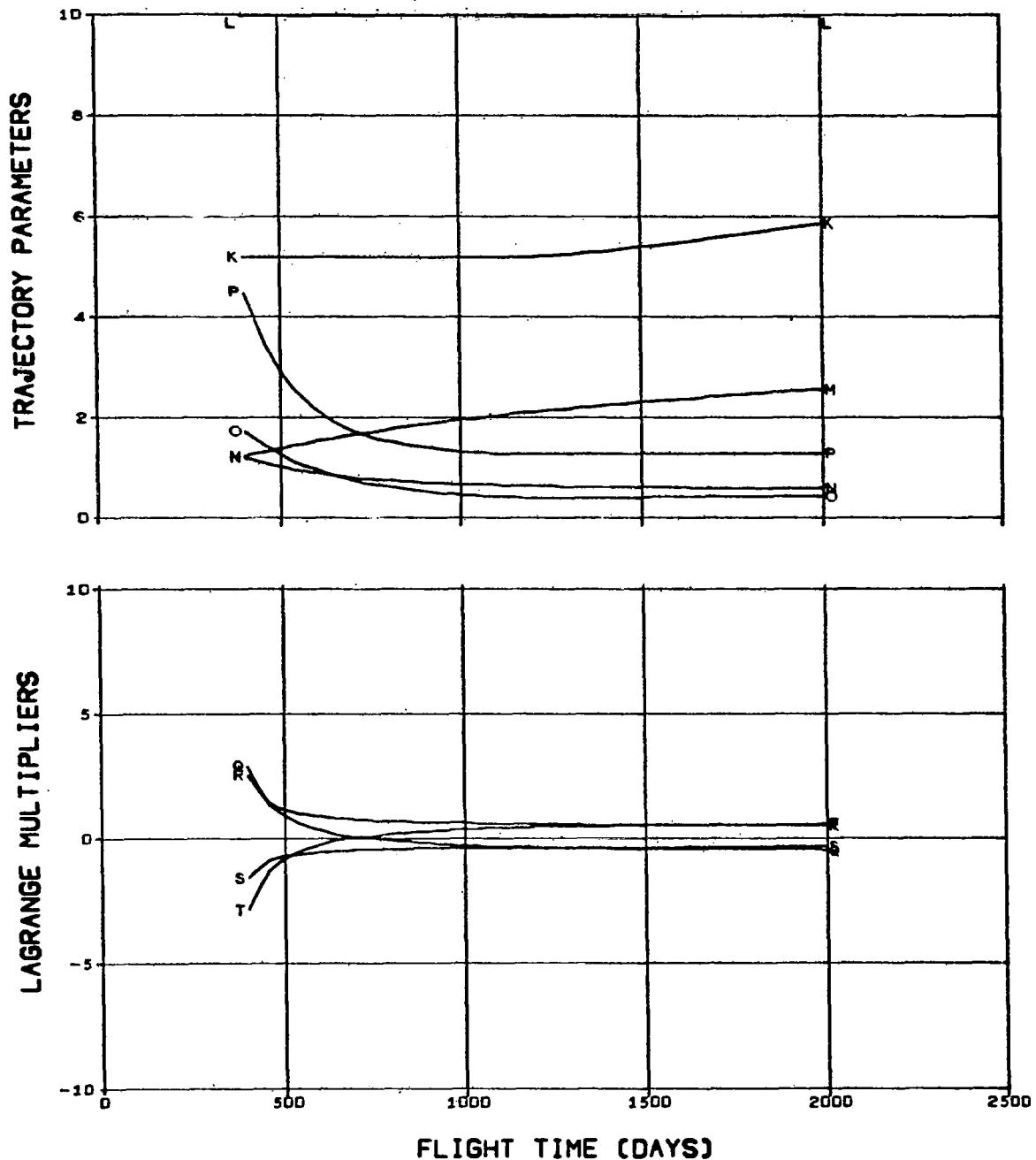


FIG. 5.3.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/1000

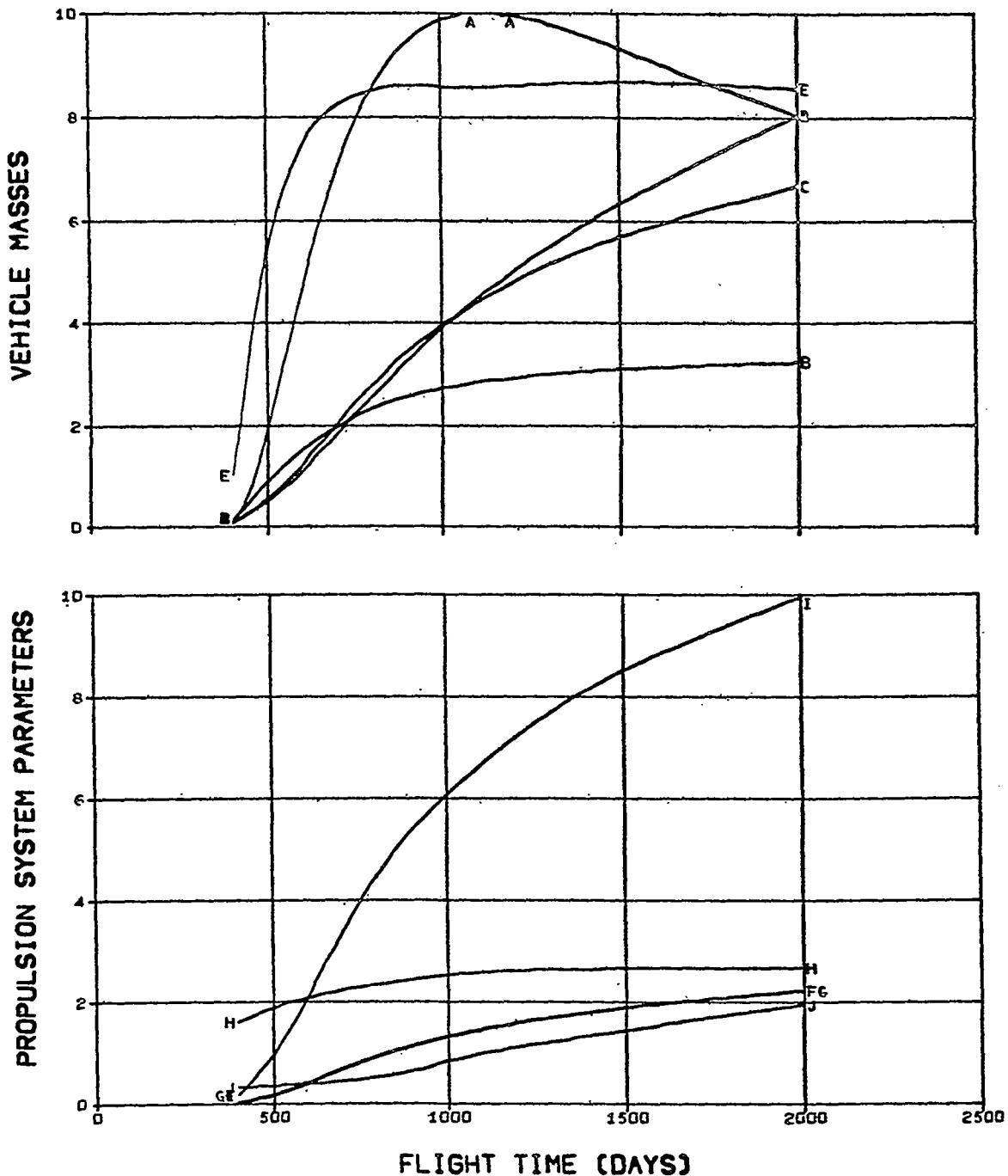


FIG. 5.3.3 JUPITER MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER/10
 N LAUNCH EXCESS SPEED (M/SEC)/10000 S X-COMPONENT OF PRIMER DERIVATIVE/10
 O ARRIVAL EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE

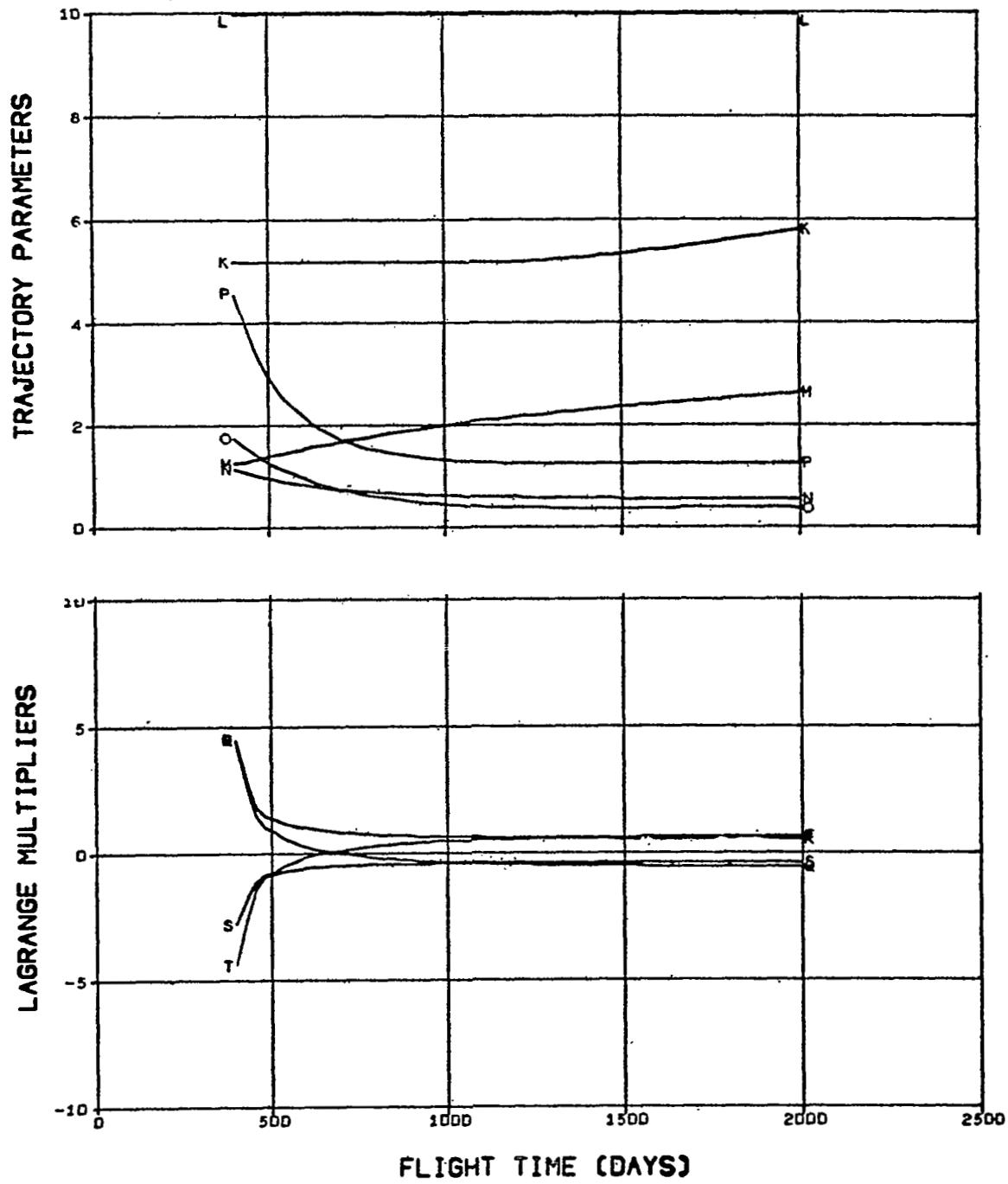


FIG. 5.3.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.D0E-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/100

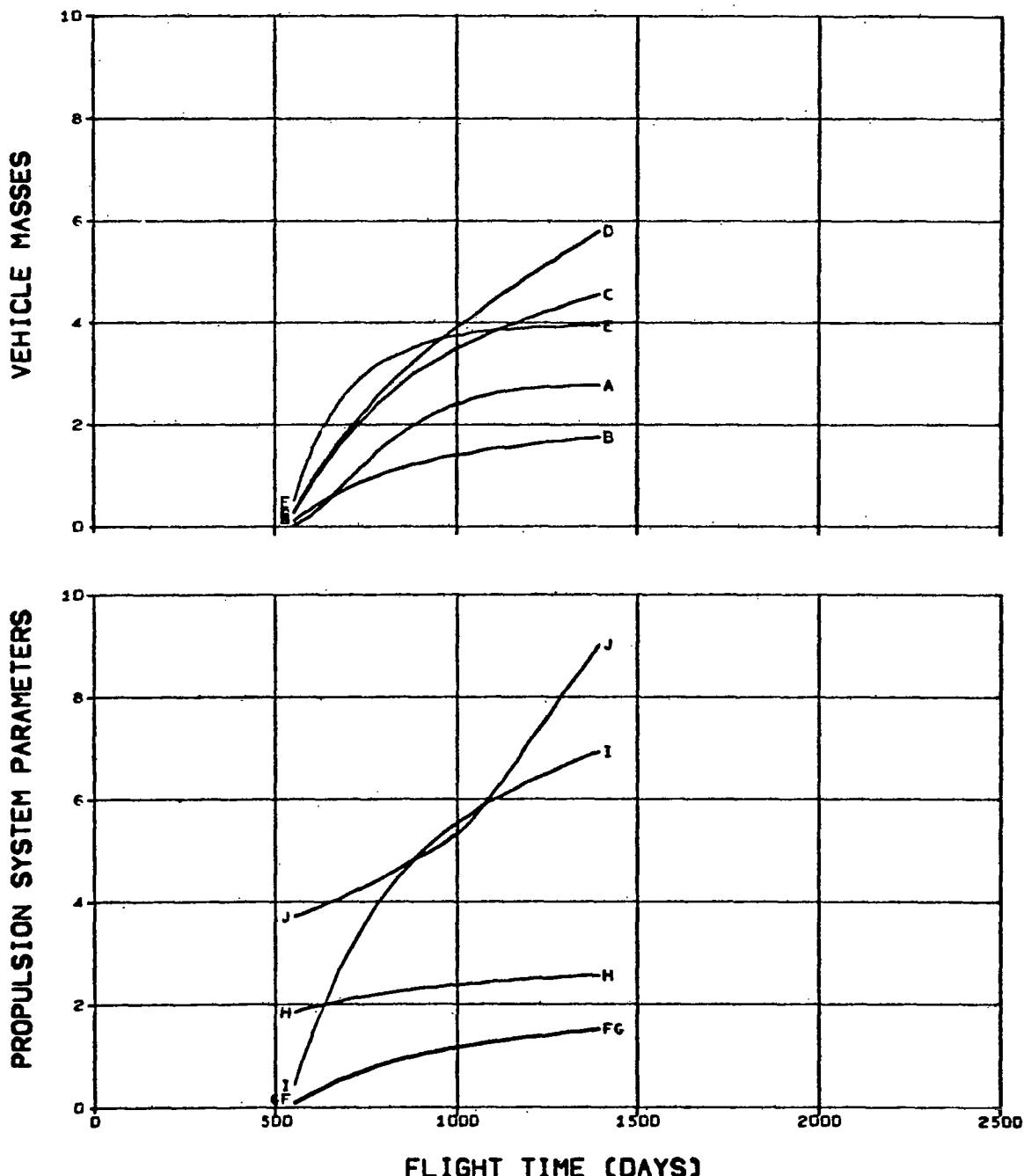


FIG. 5.3.4 JUPITER MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

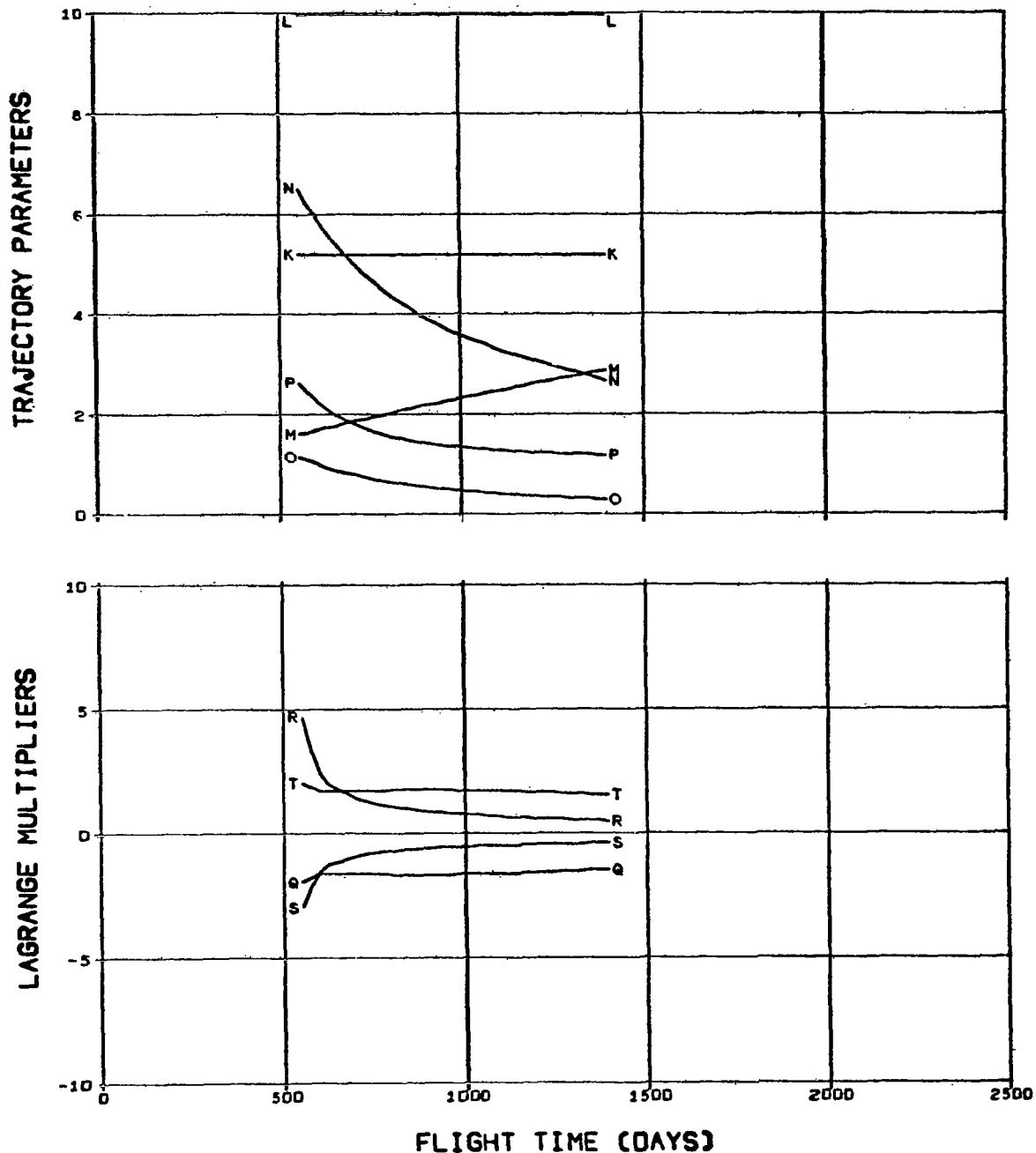


FIG. 5.3.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

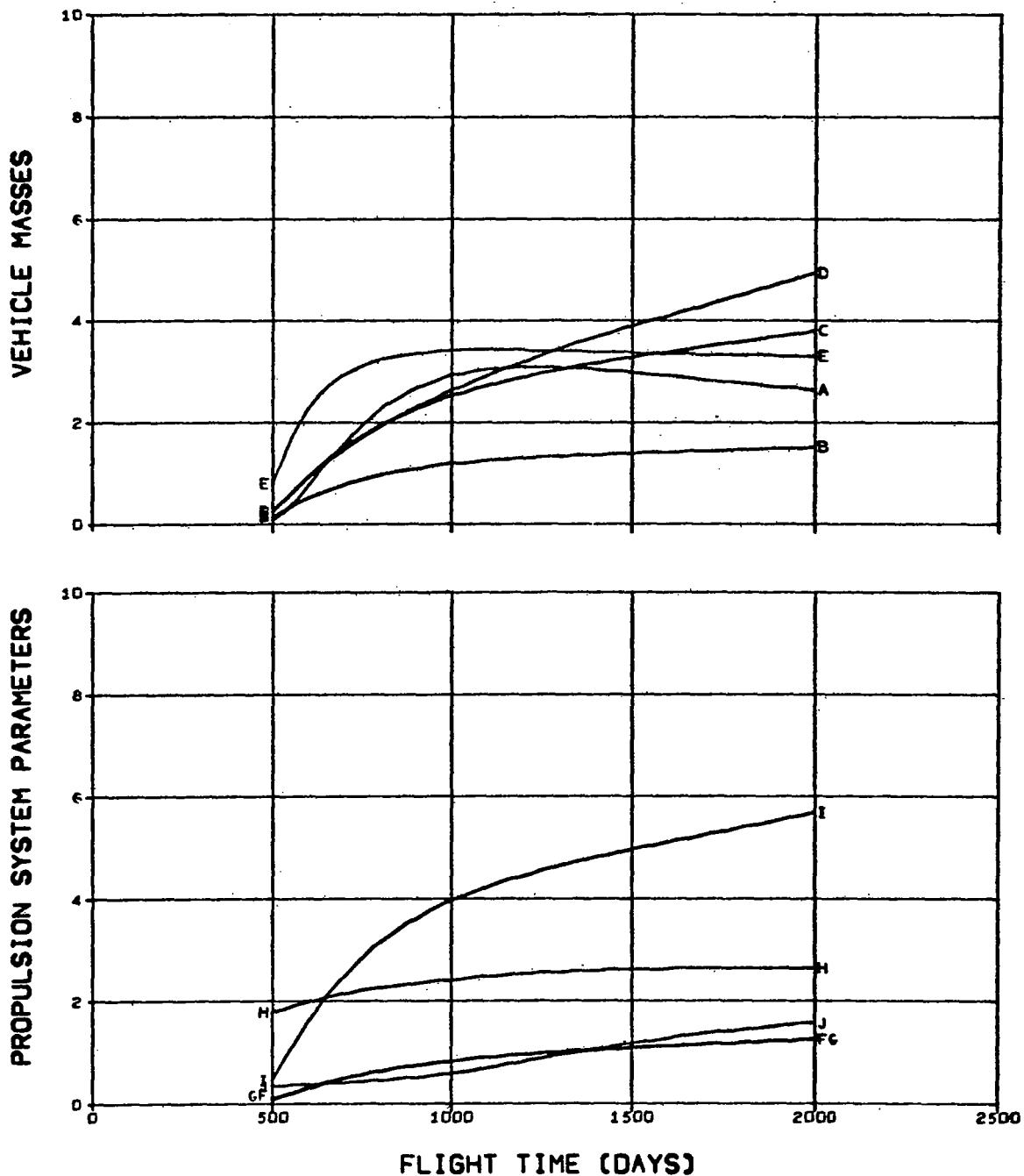


FIG. 5.3.5 JUPITER MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE/10
 O ARRIVAL EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

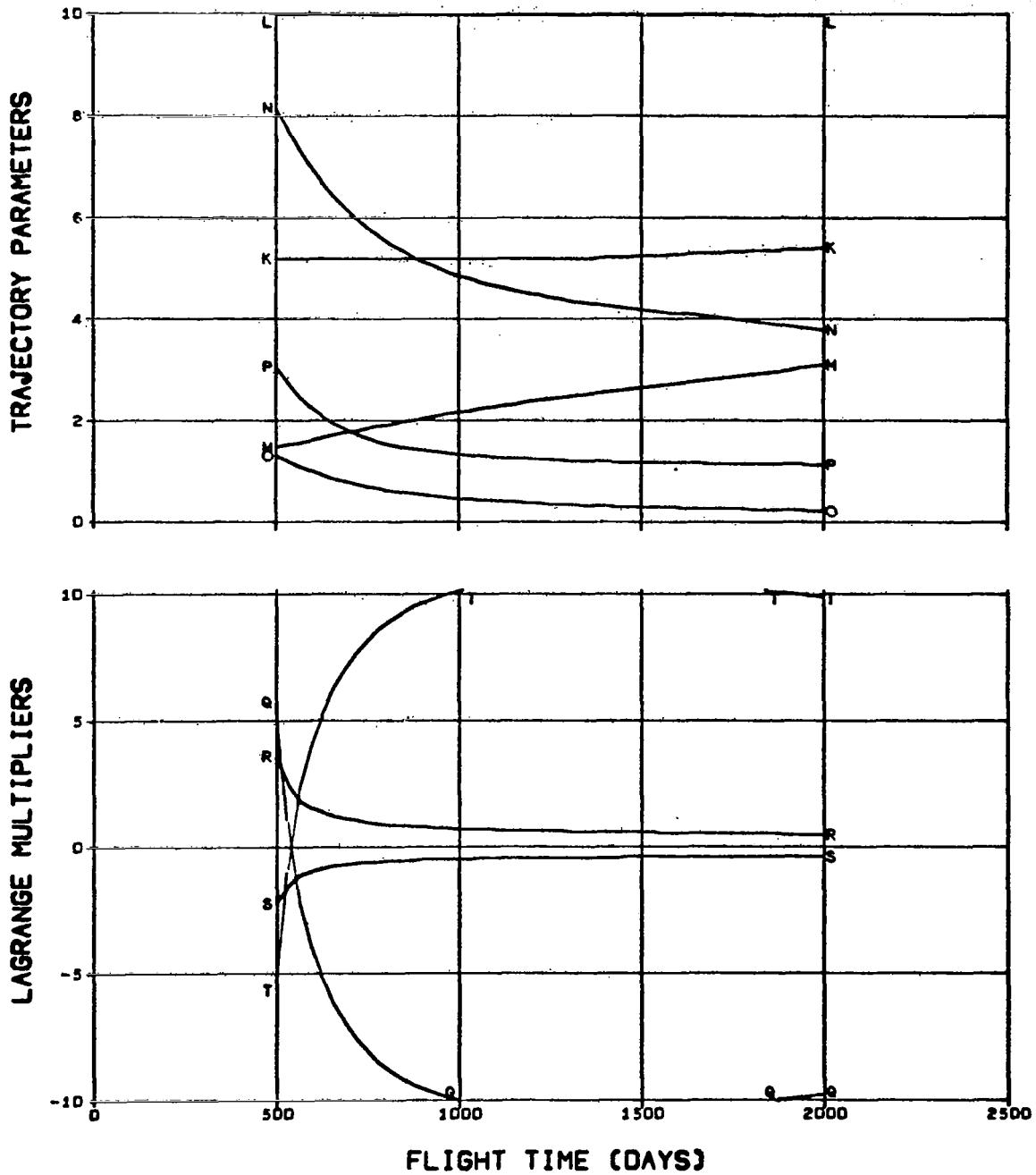


FIG. 5.3.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/10G	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

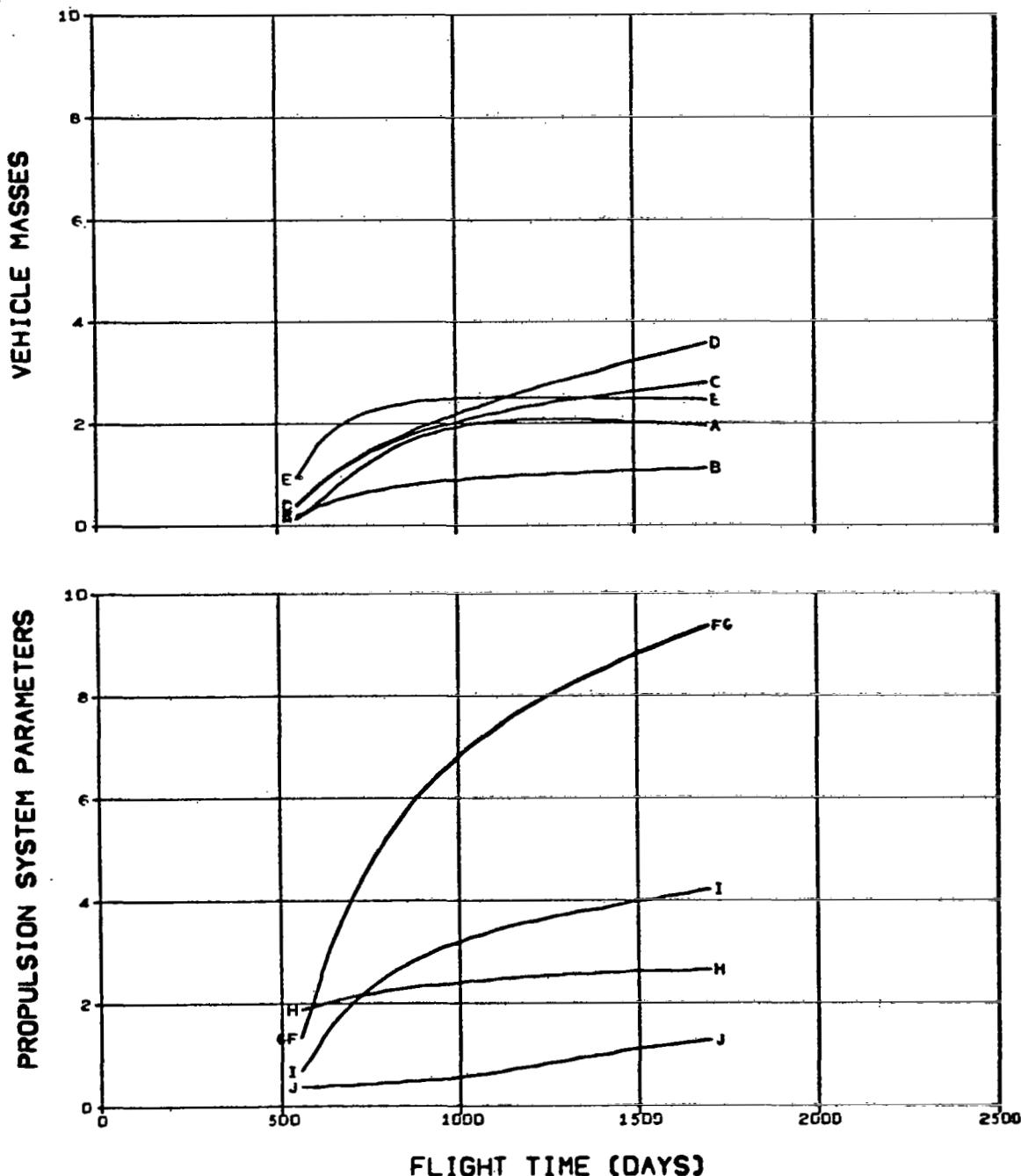


FIG. 5.3.6 JUPITER MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE/10
 T Y-COMPONENT OF PRIMER DERIVATIVE

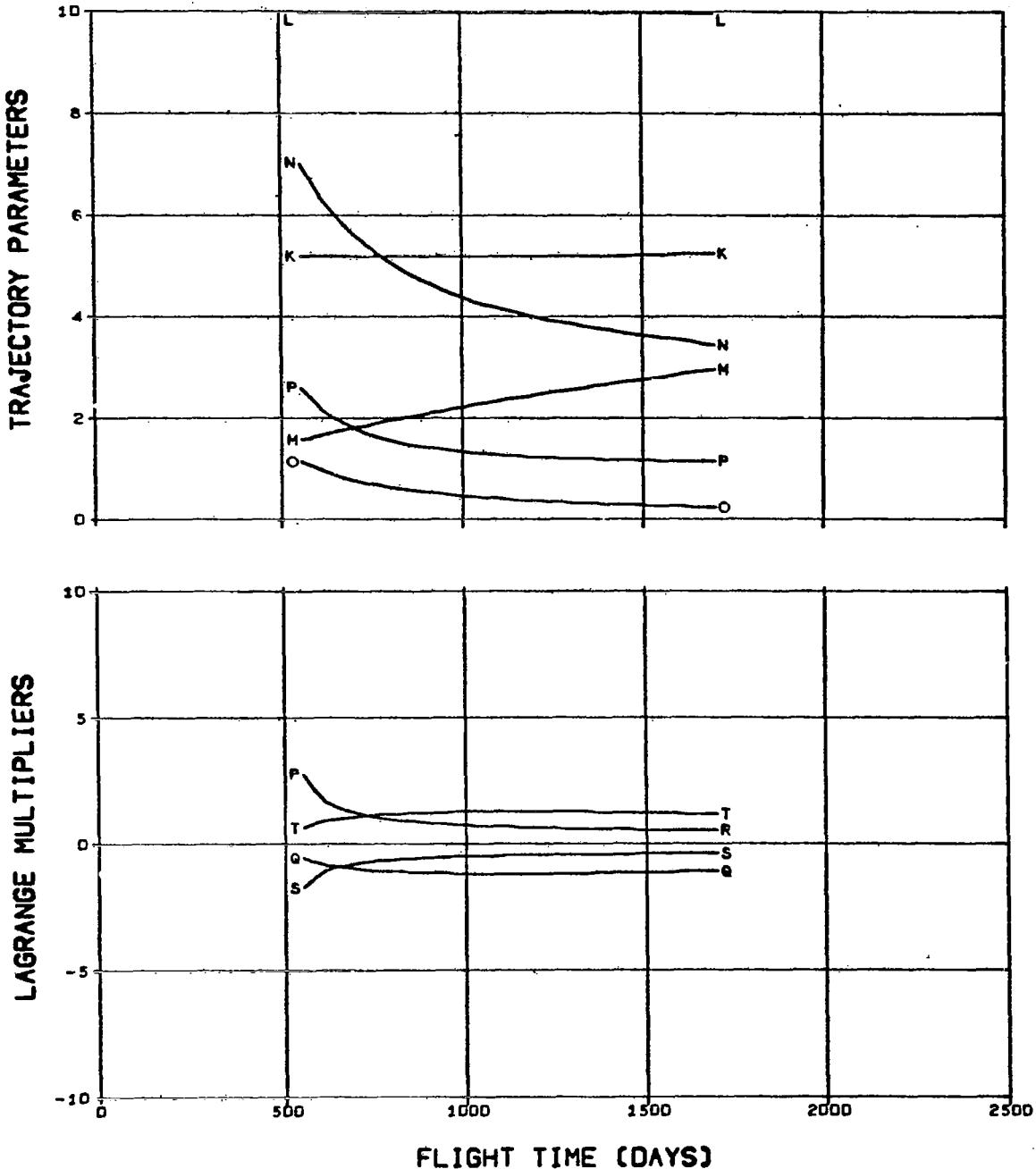


FIG. 5.3.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 2 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

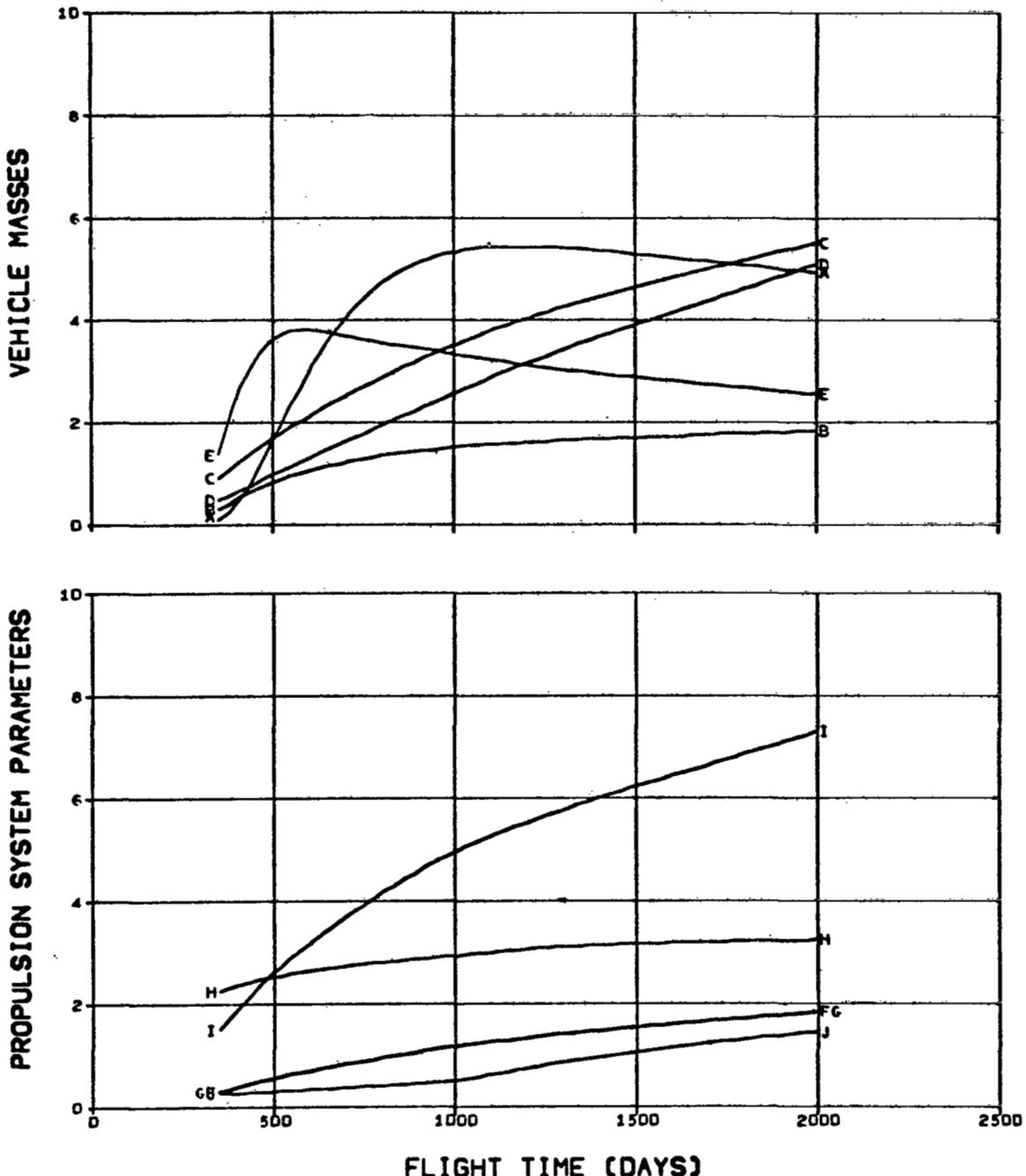


FIG. 5.4.1 JUPITER MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/10000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE

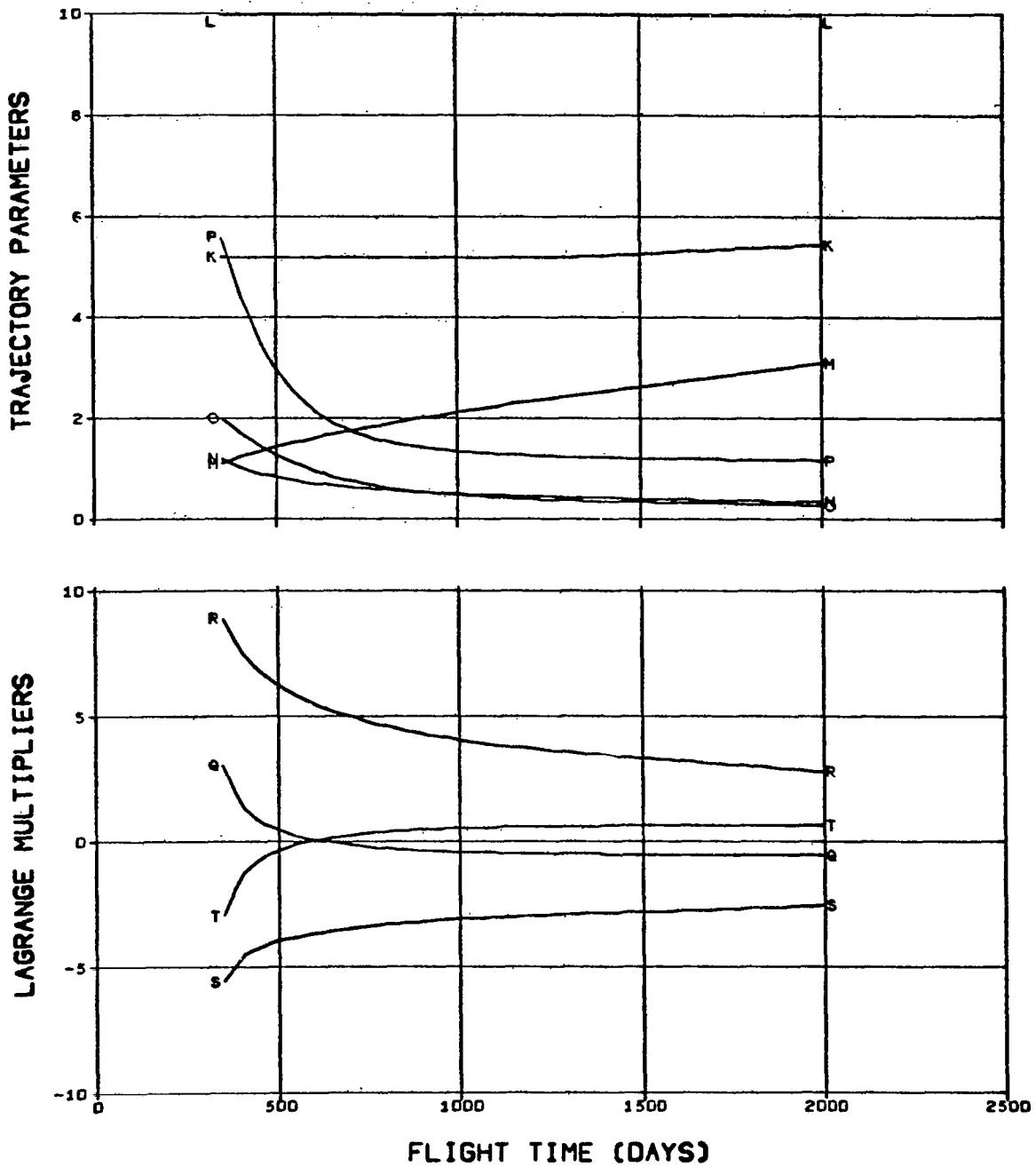
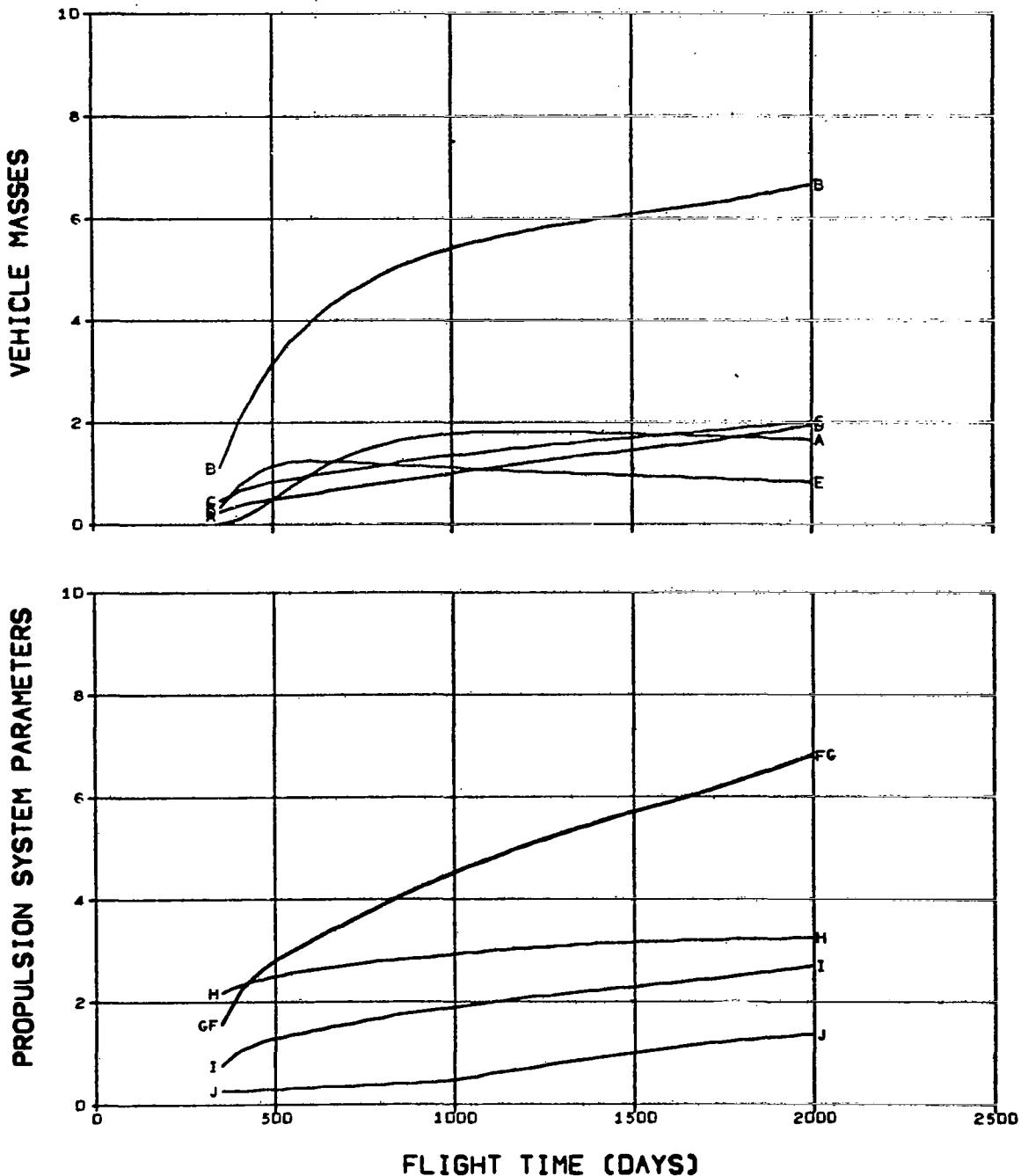


FIG. 5.4.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.4.2 JUPITER MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

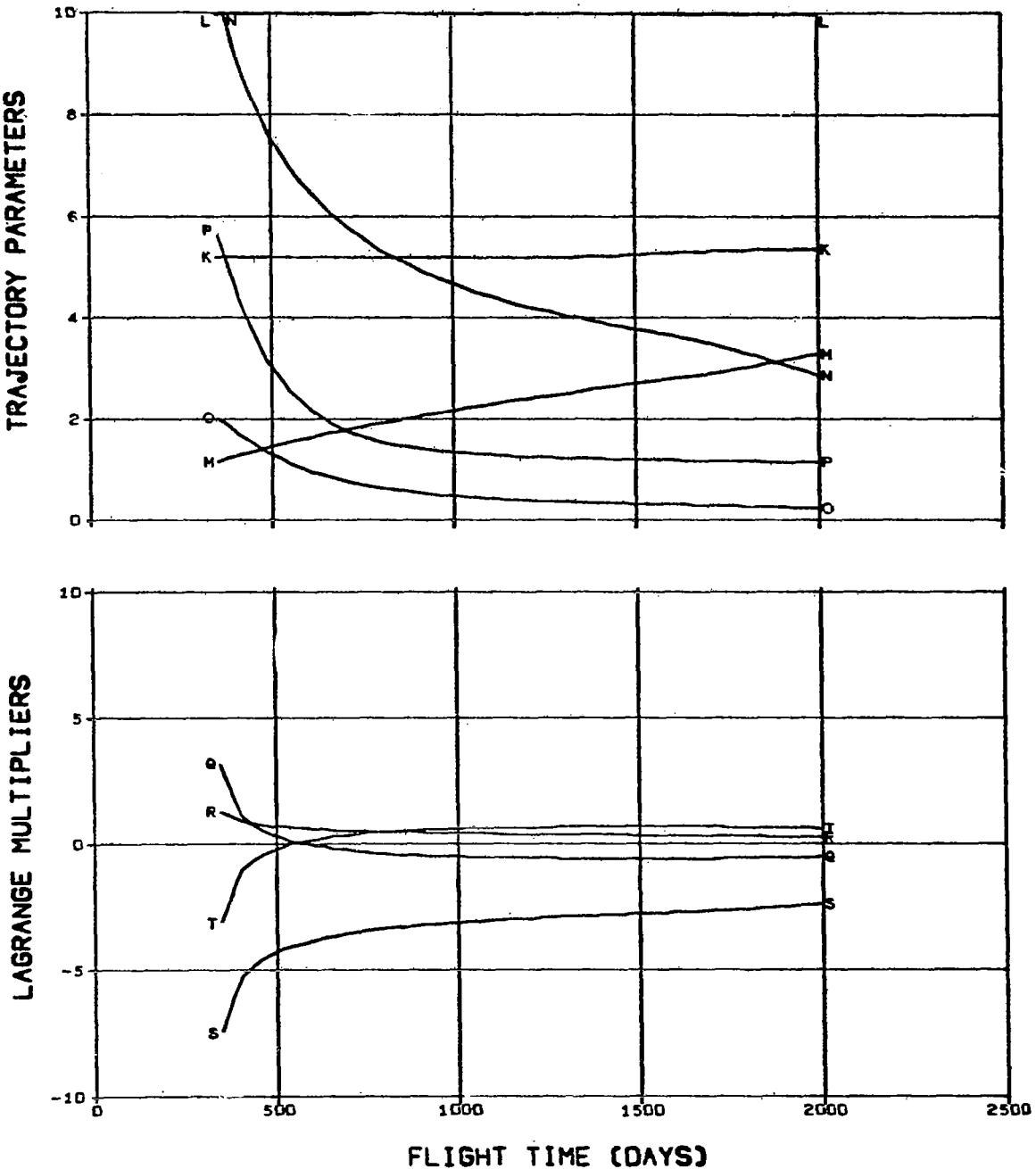


FIG. 5.4.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

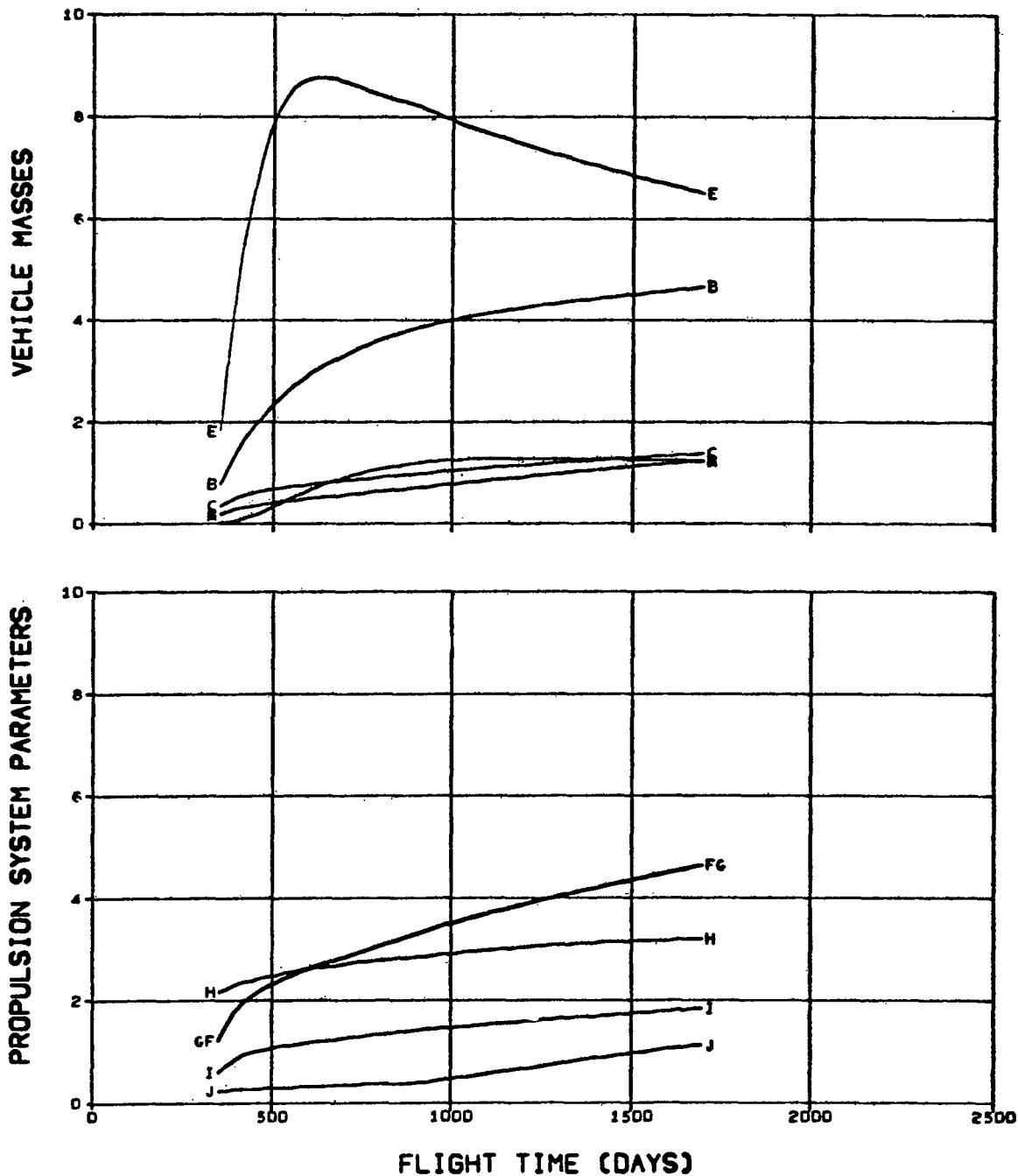


FIG. 5.4.3 JUPITER MODE A ORBITER MISSIONS
TITAN III X[1205]/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/100000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

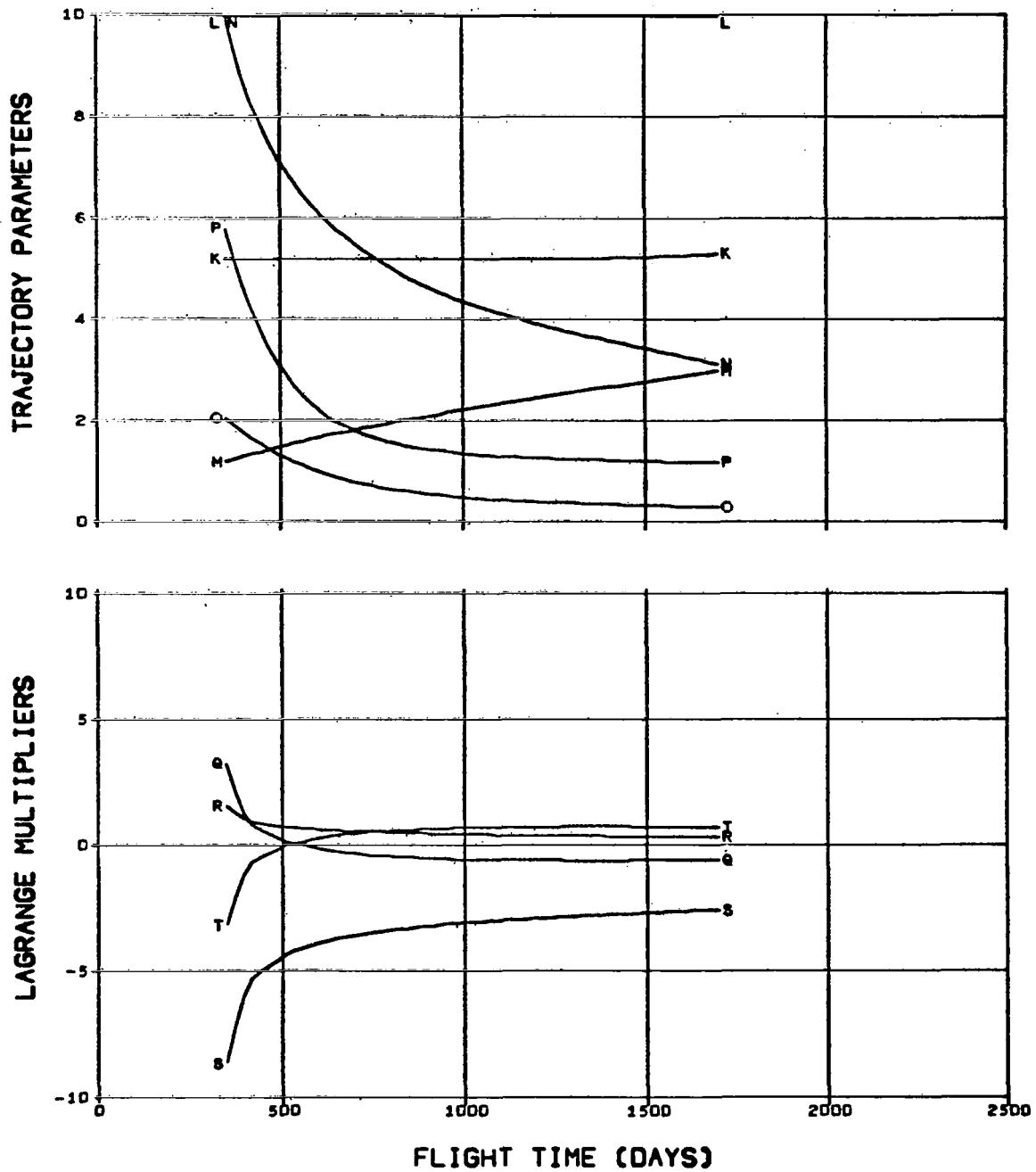


FIG. 5.4.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.0DE-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/100

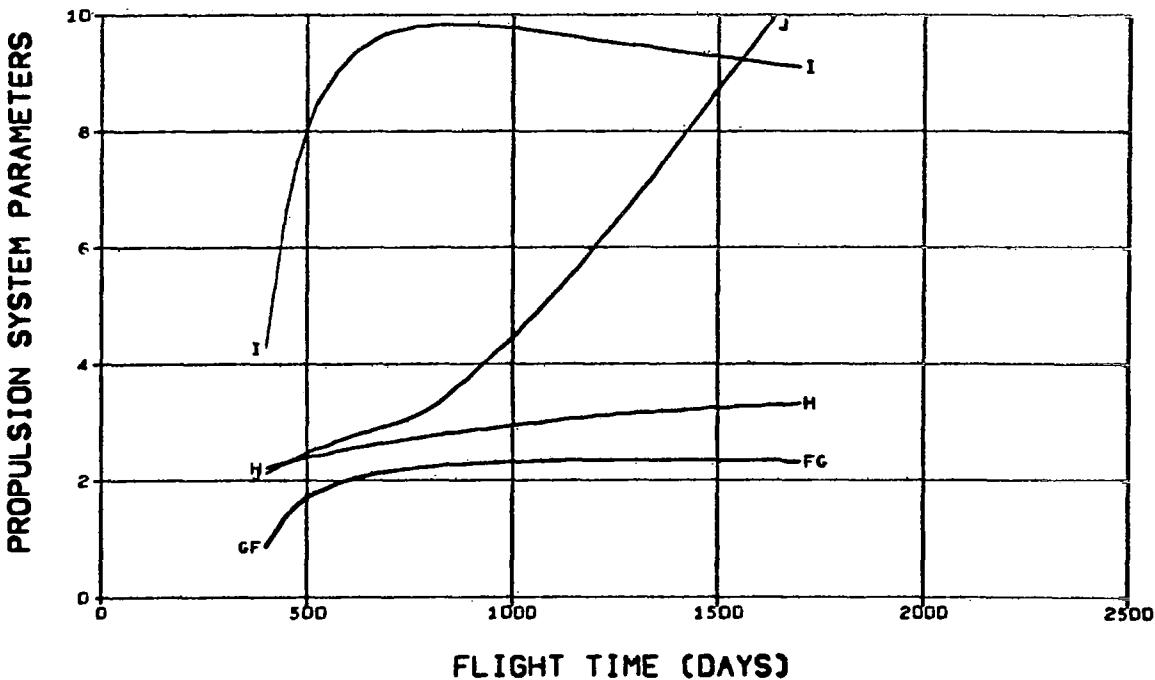
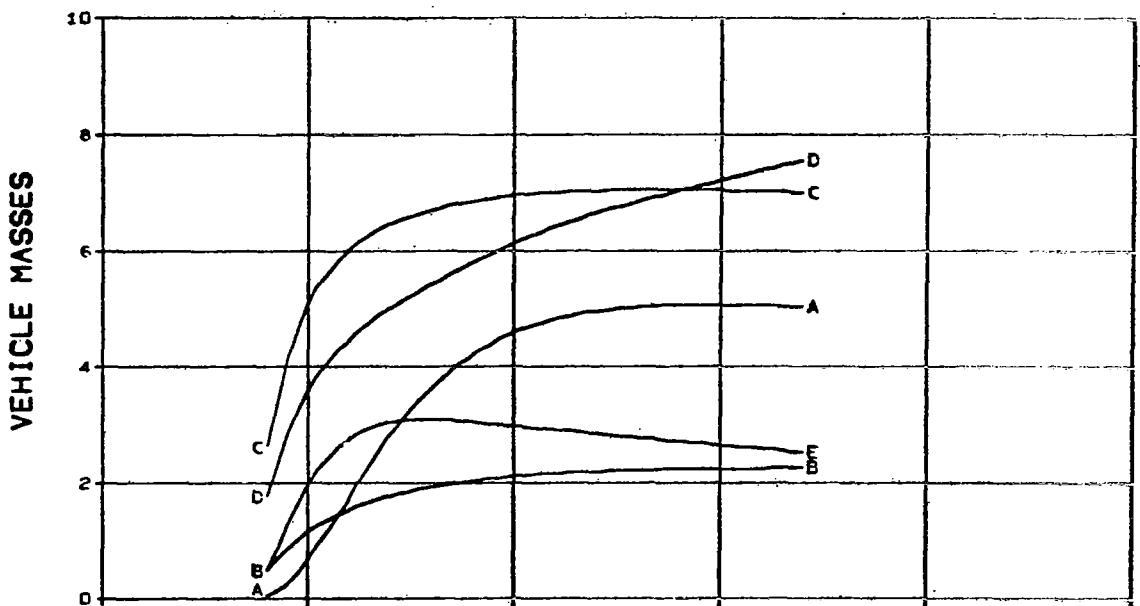


FIG. 5.4.4 JUPITER MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPELLANT SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

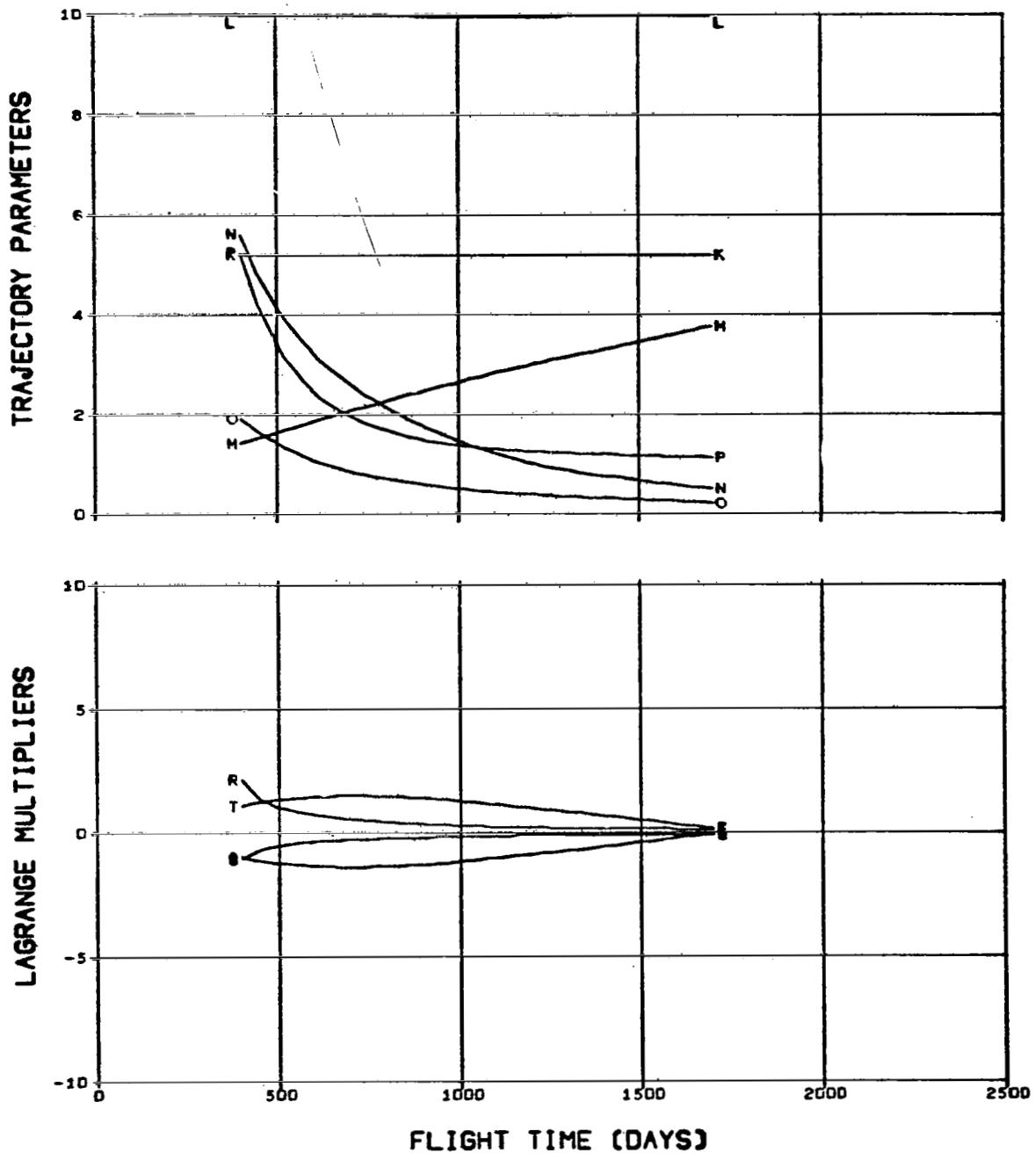


FIG. 5.4.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/100

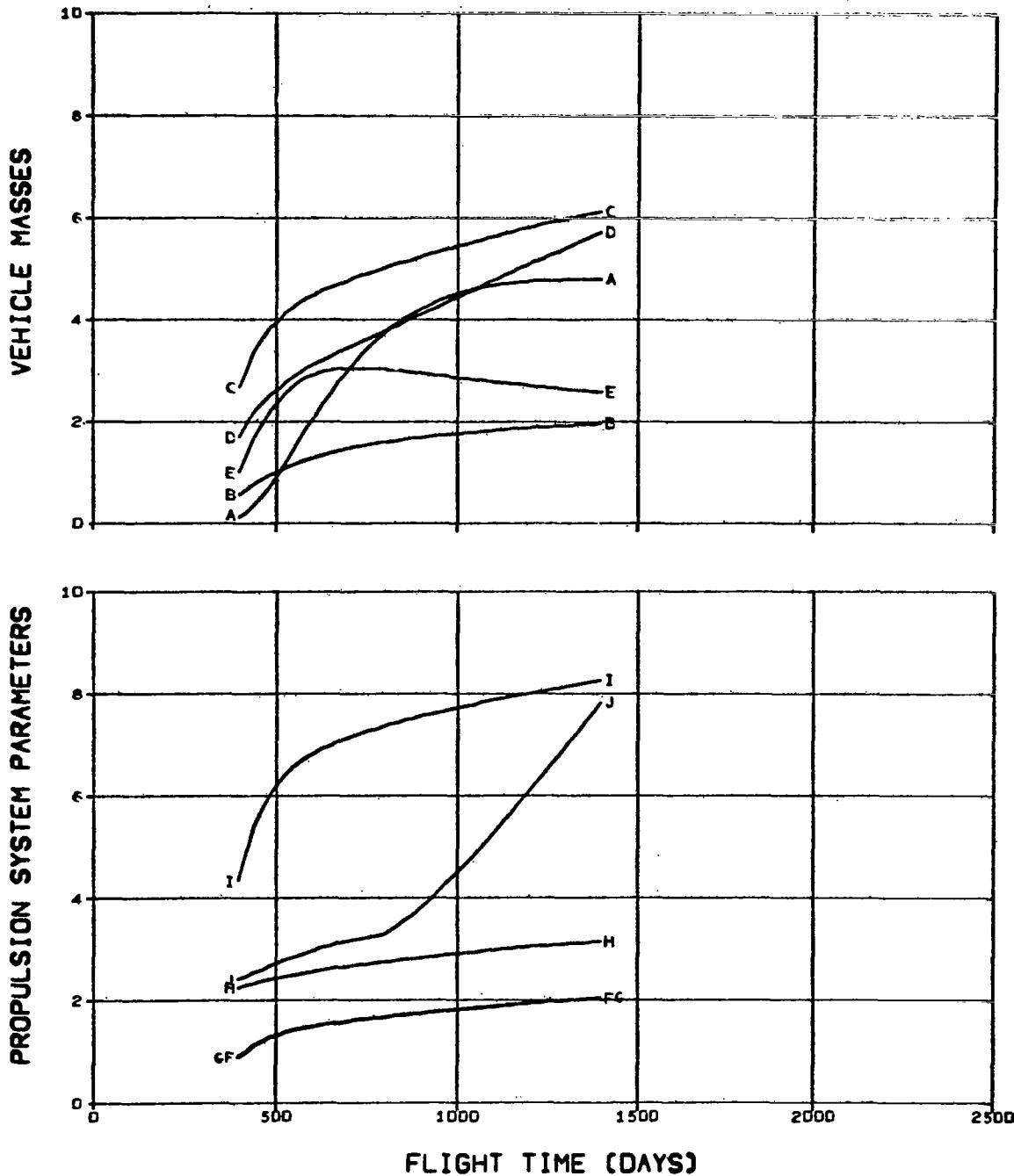


FIG. 5.4.5 JUPITER MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 F RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.00E-1
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

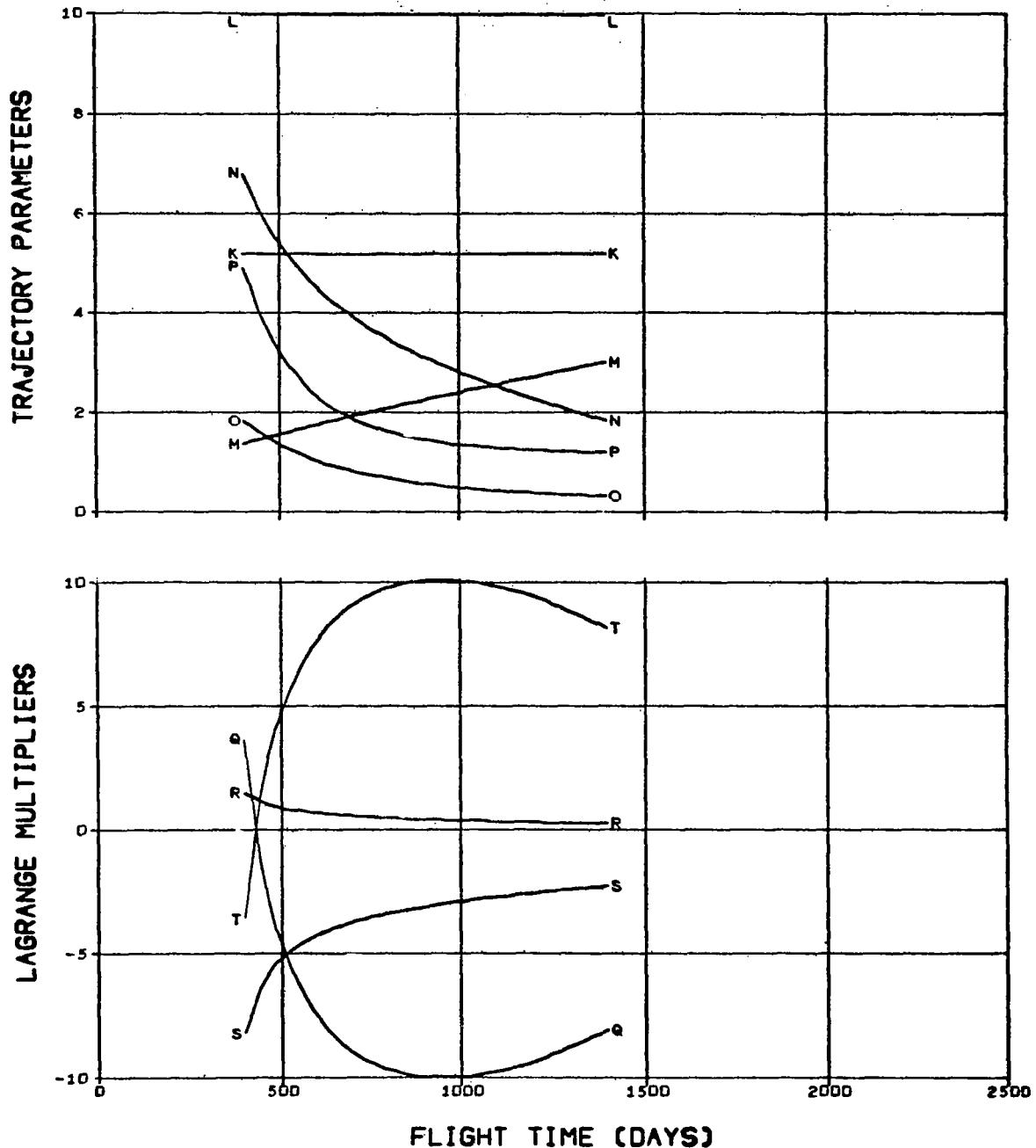
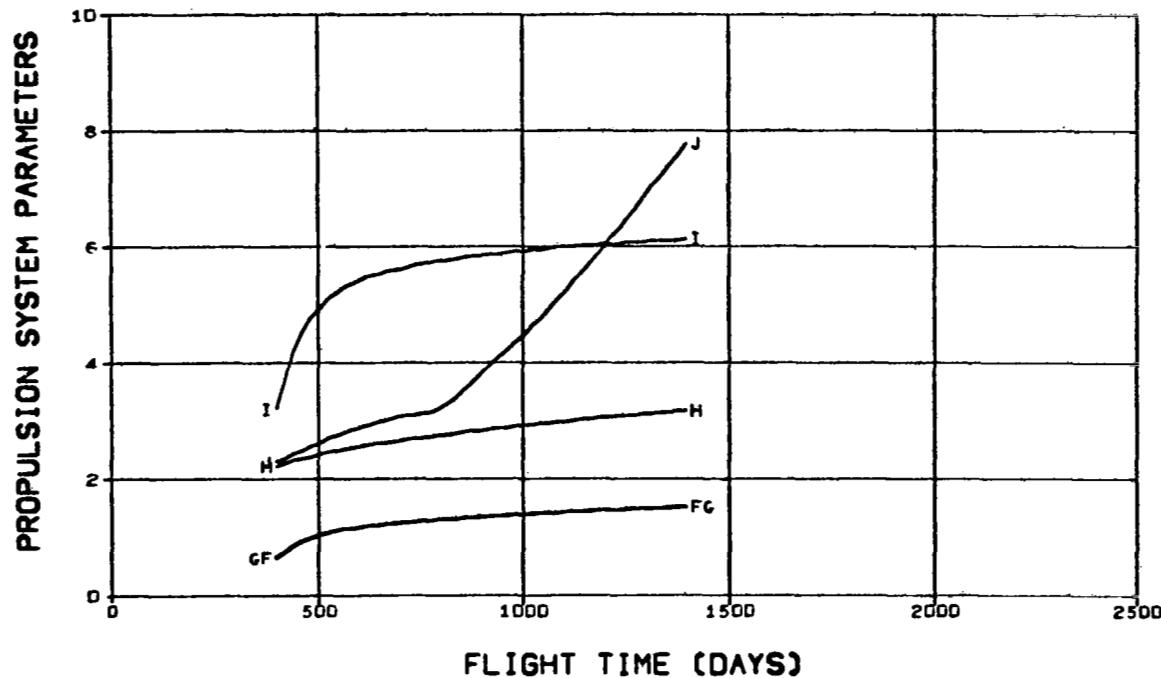
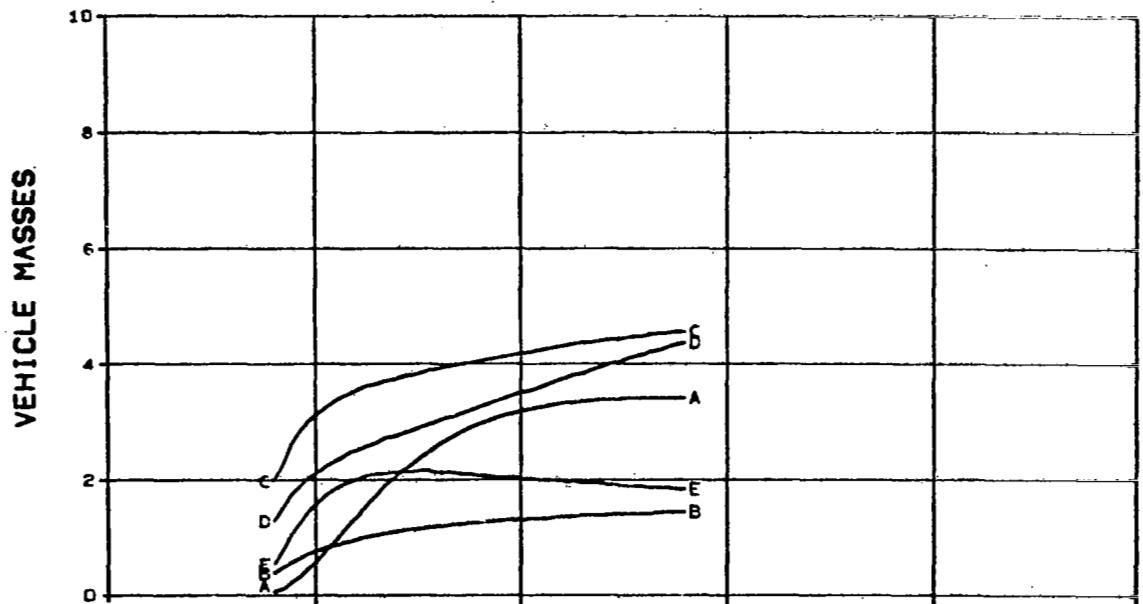


FIG. 5.4.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.00E-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/100



**FIG. 5.4.6 JUPITER MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

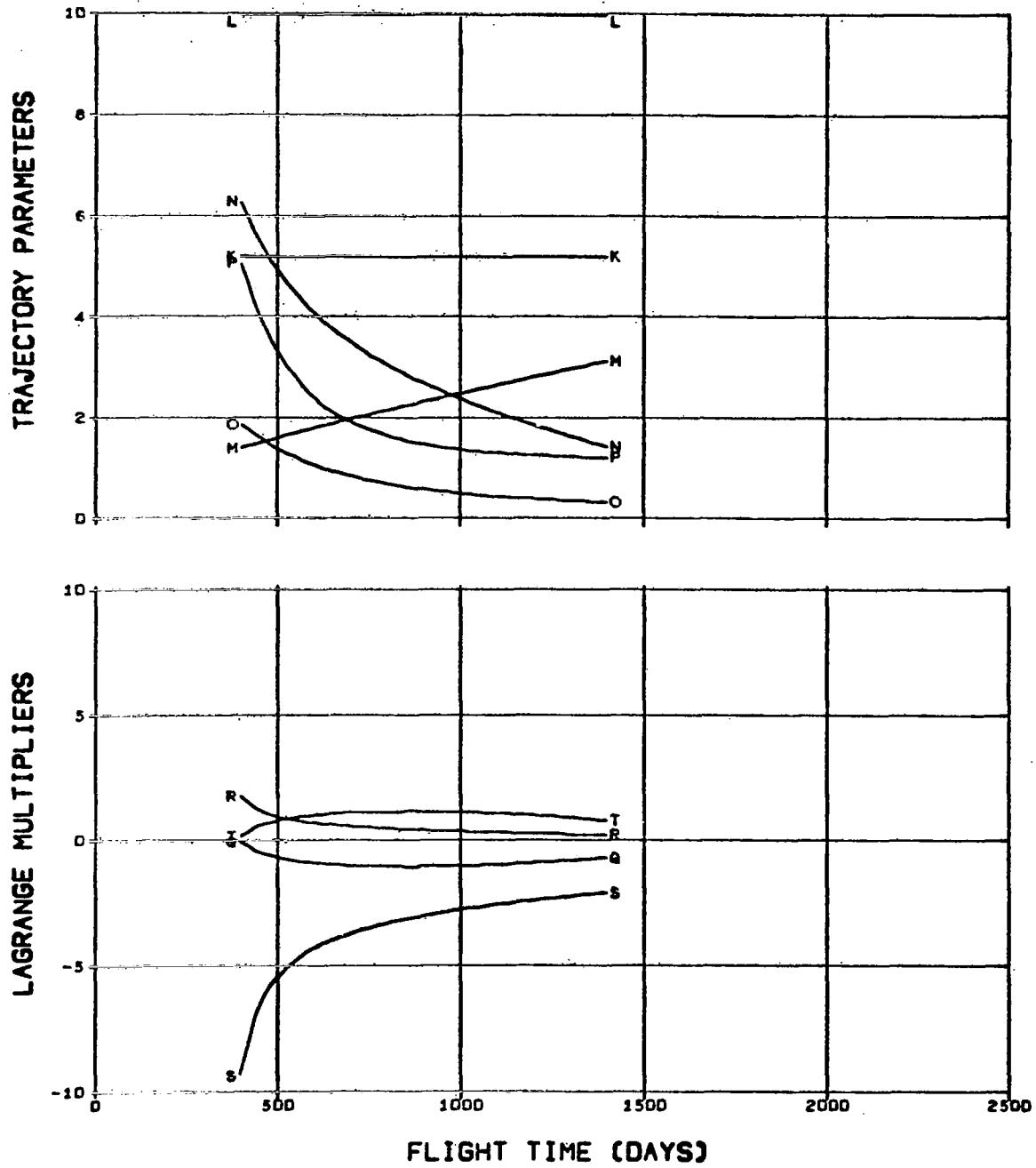
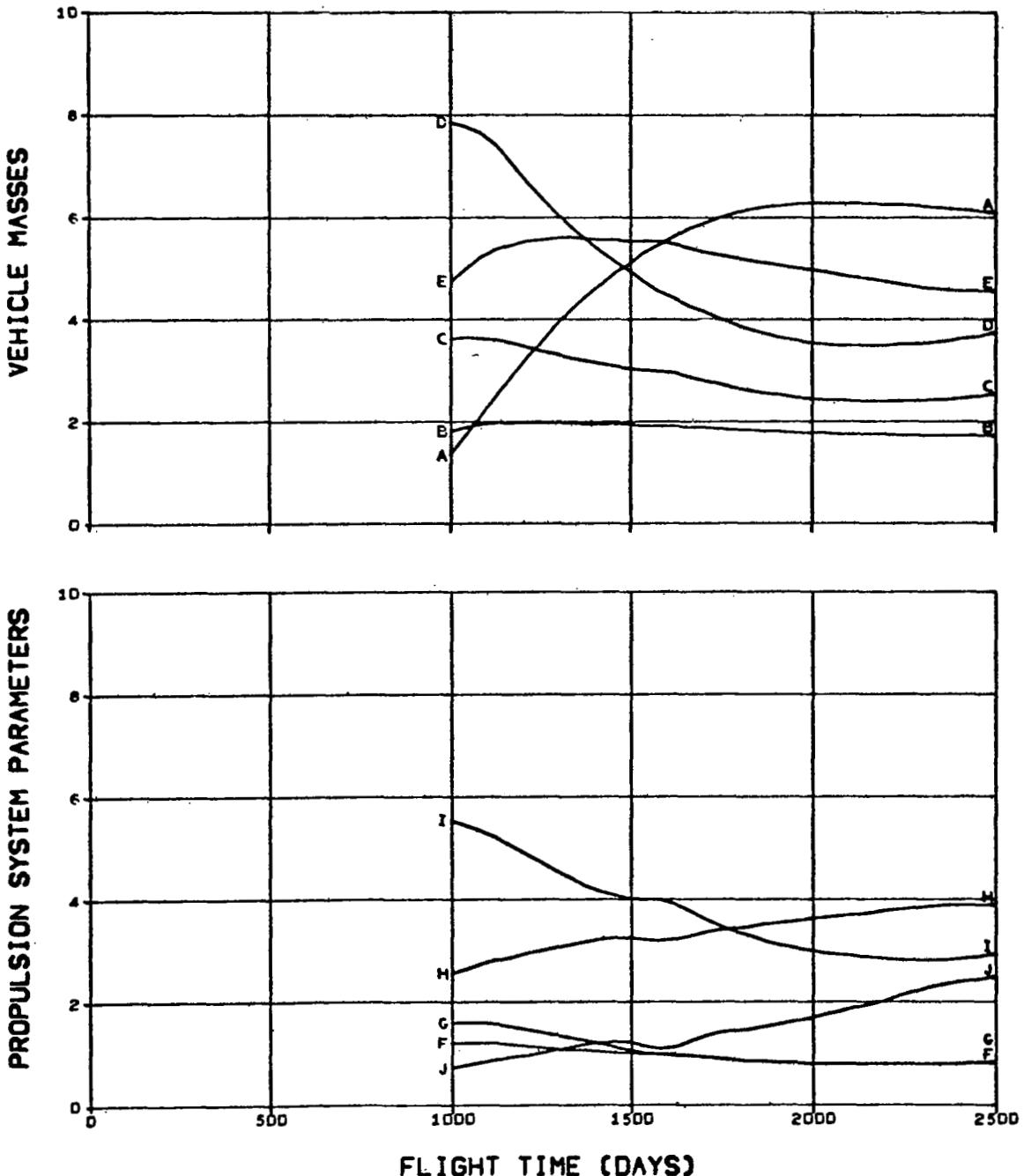


FIG. 5.4.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 5.5.1 JUPITER MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

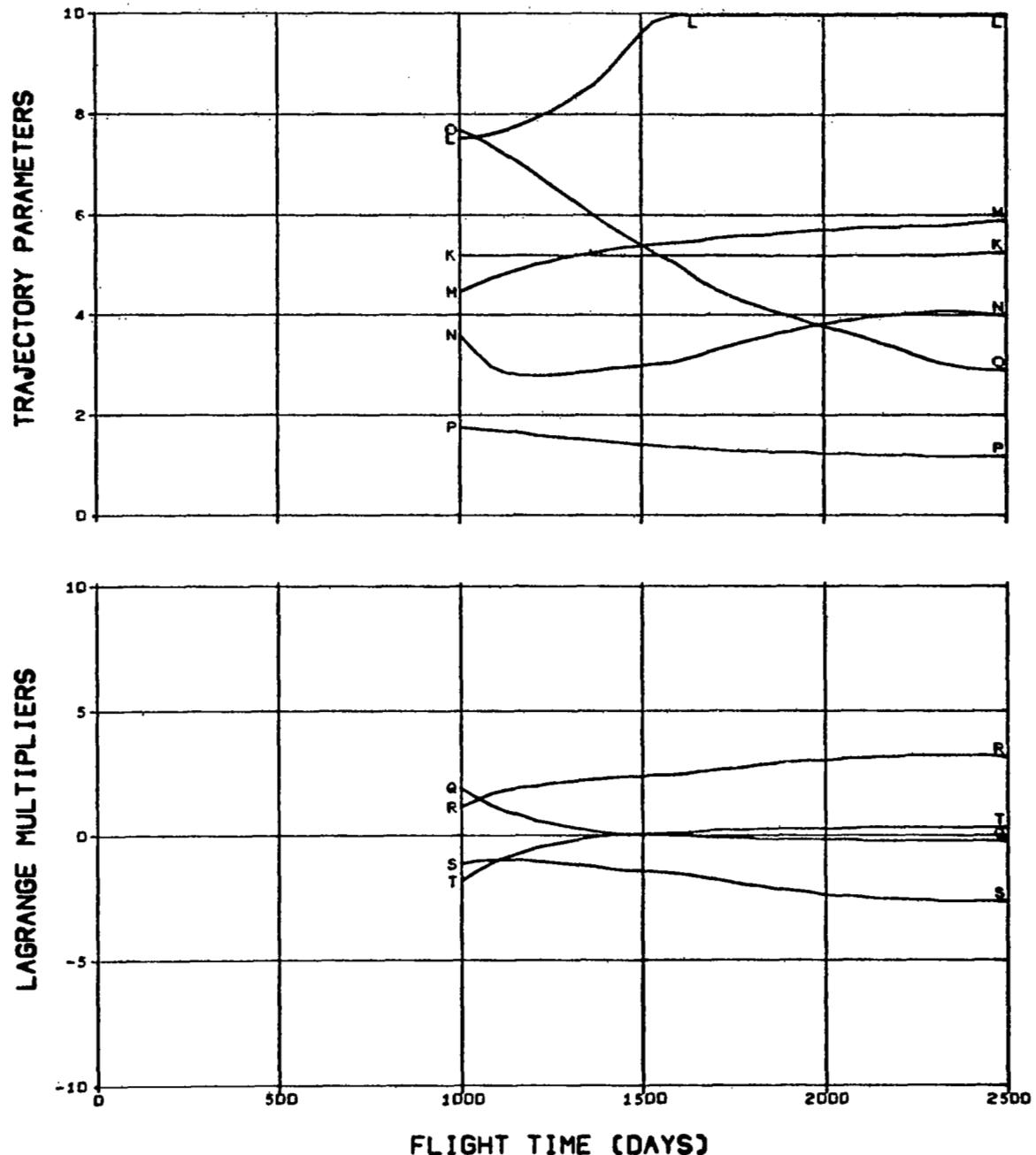


FIG. 5.5.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPULSION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	*RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

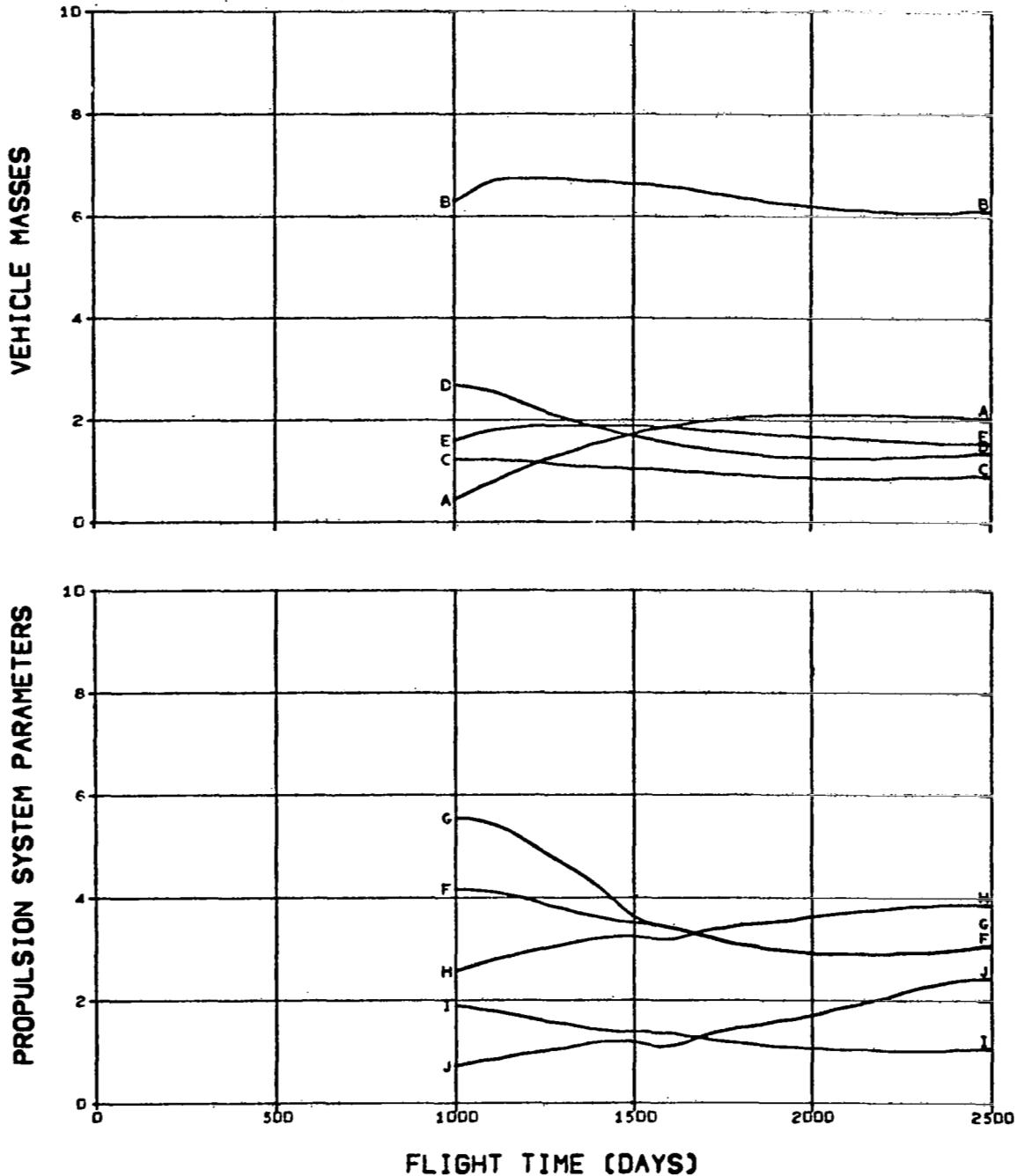


FIG. 5.5.2 JUPITER MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

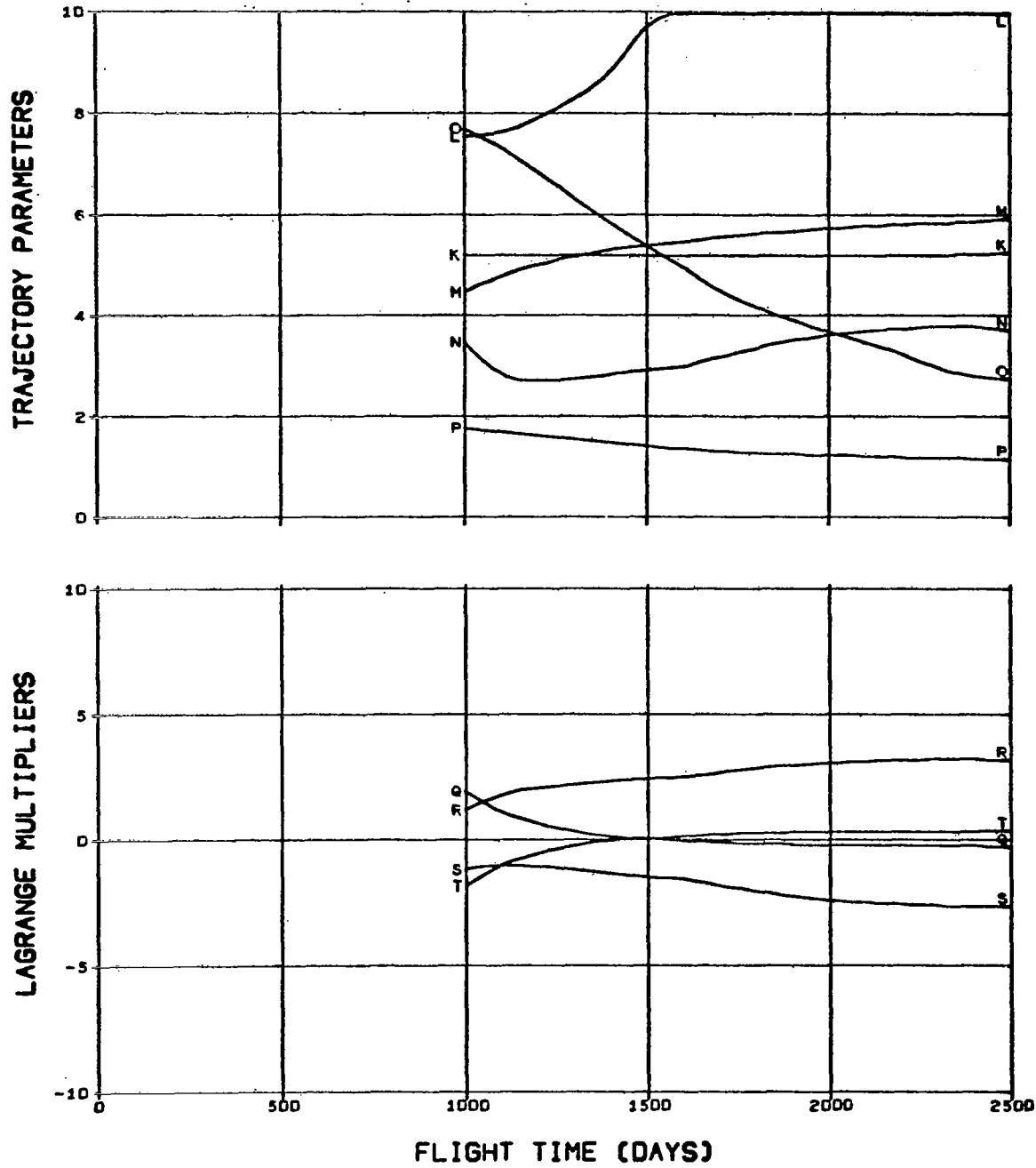
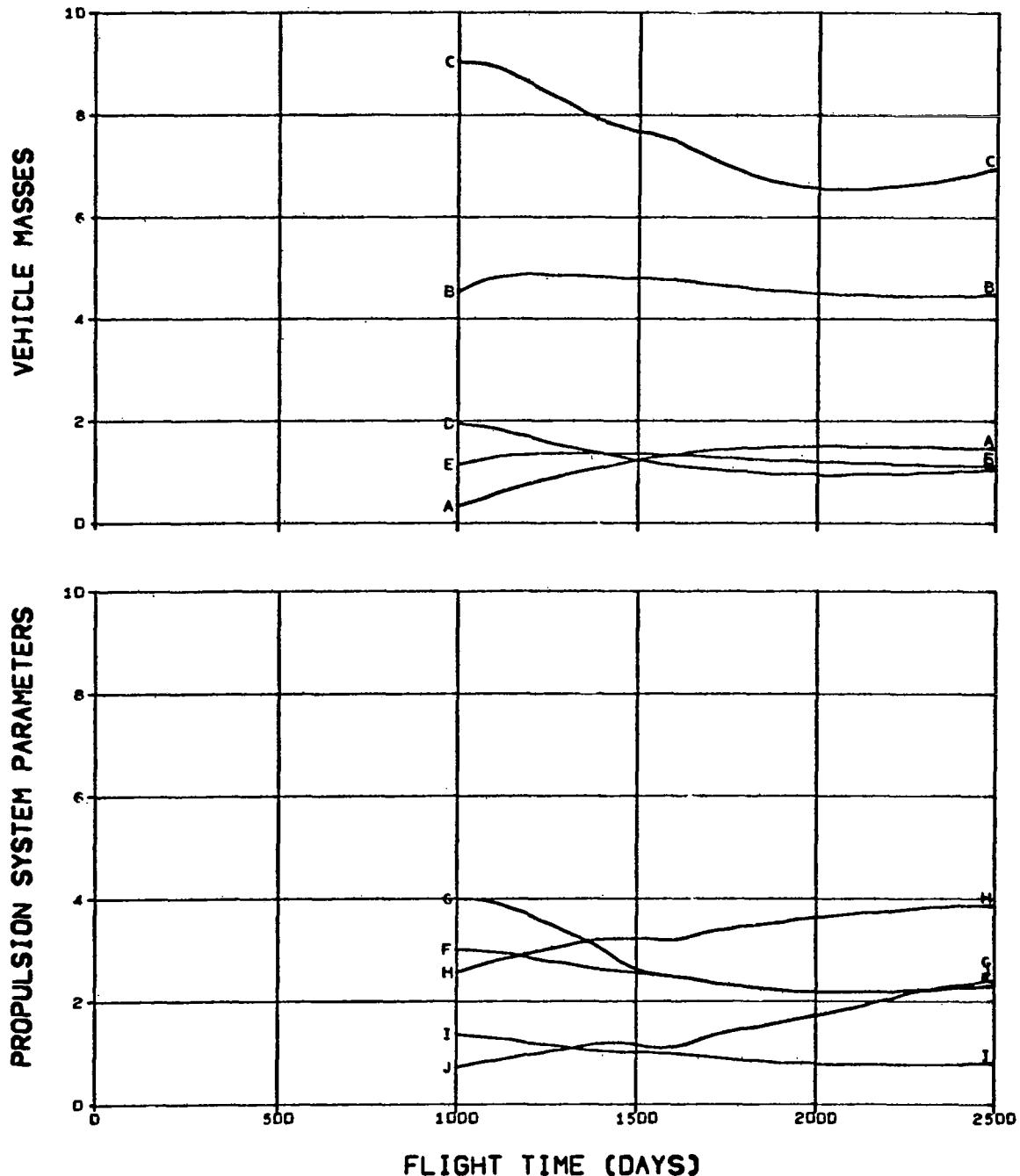


FIG. 5.5.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.5.3 JUPITER MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

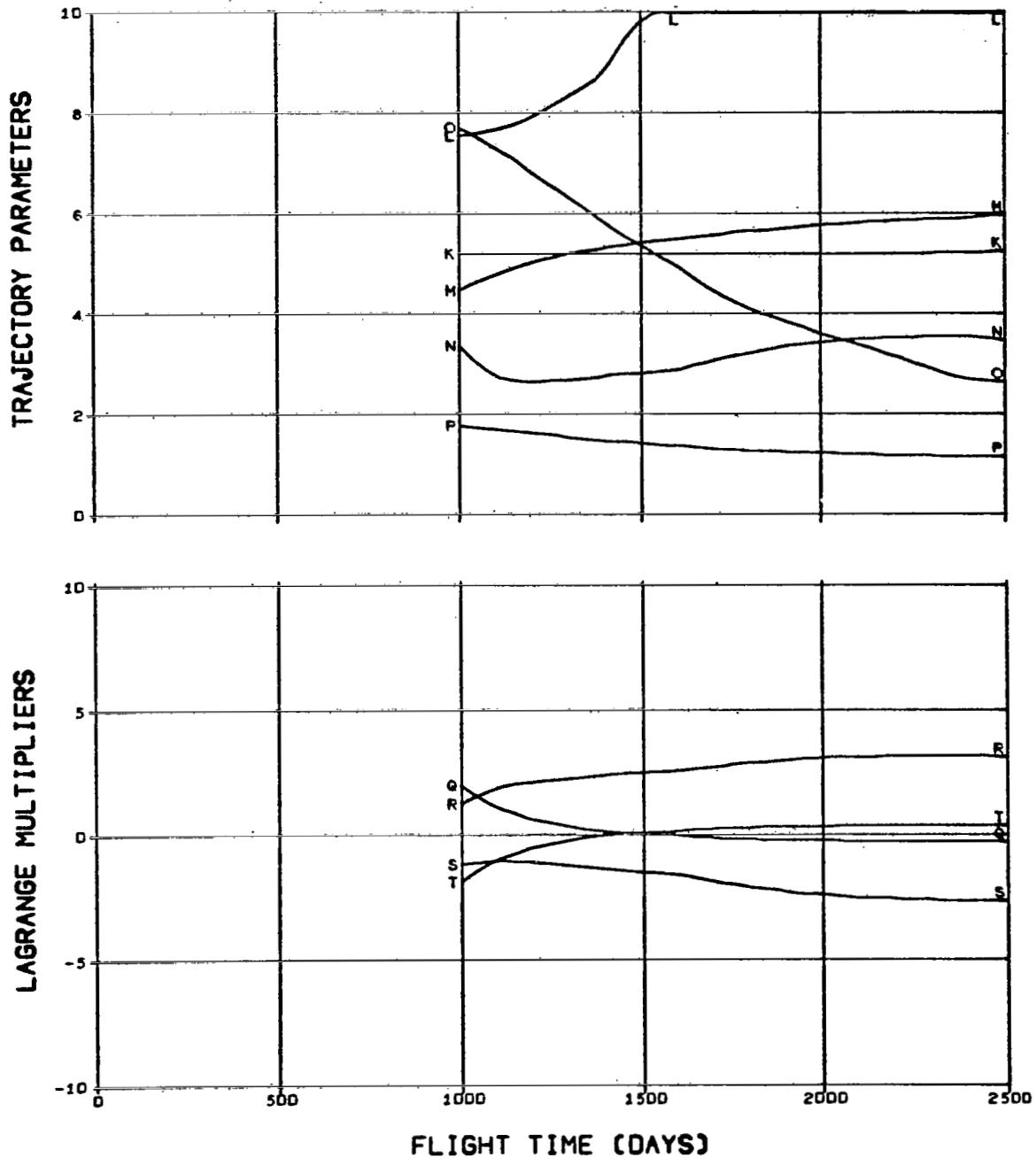
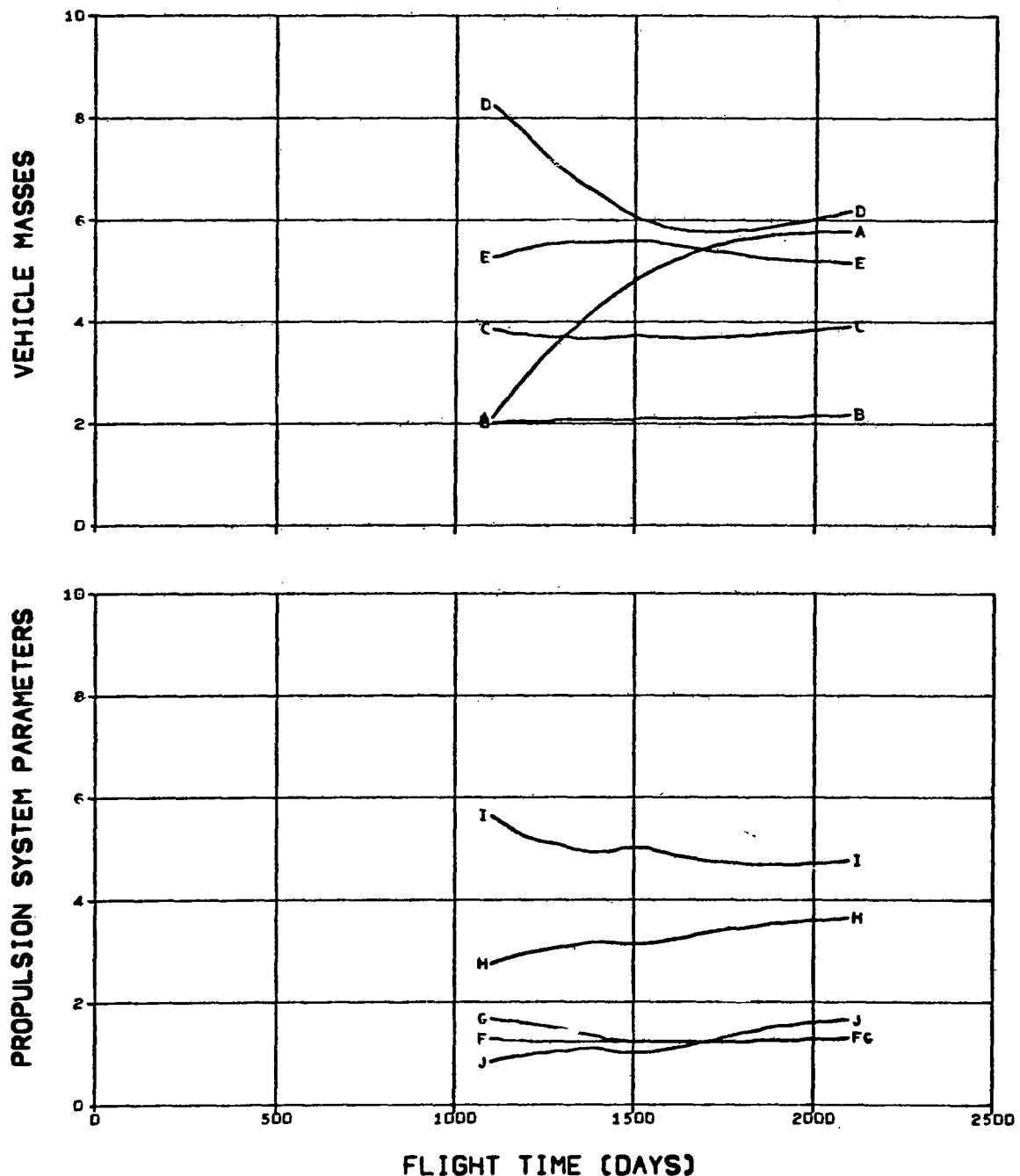


FIG. 5.5.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.5.4 JUPITER MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

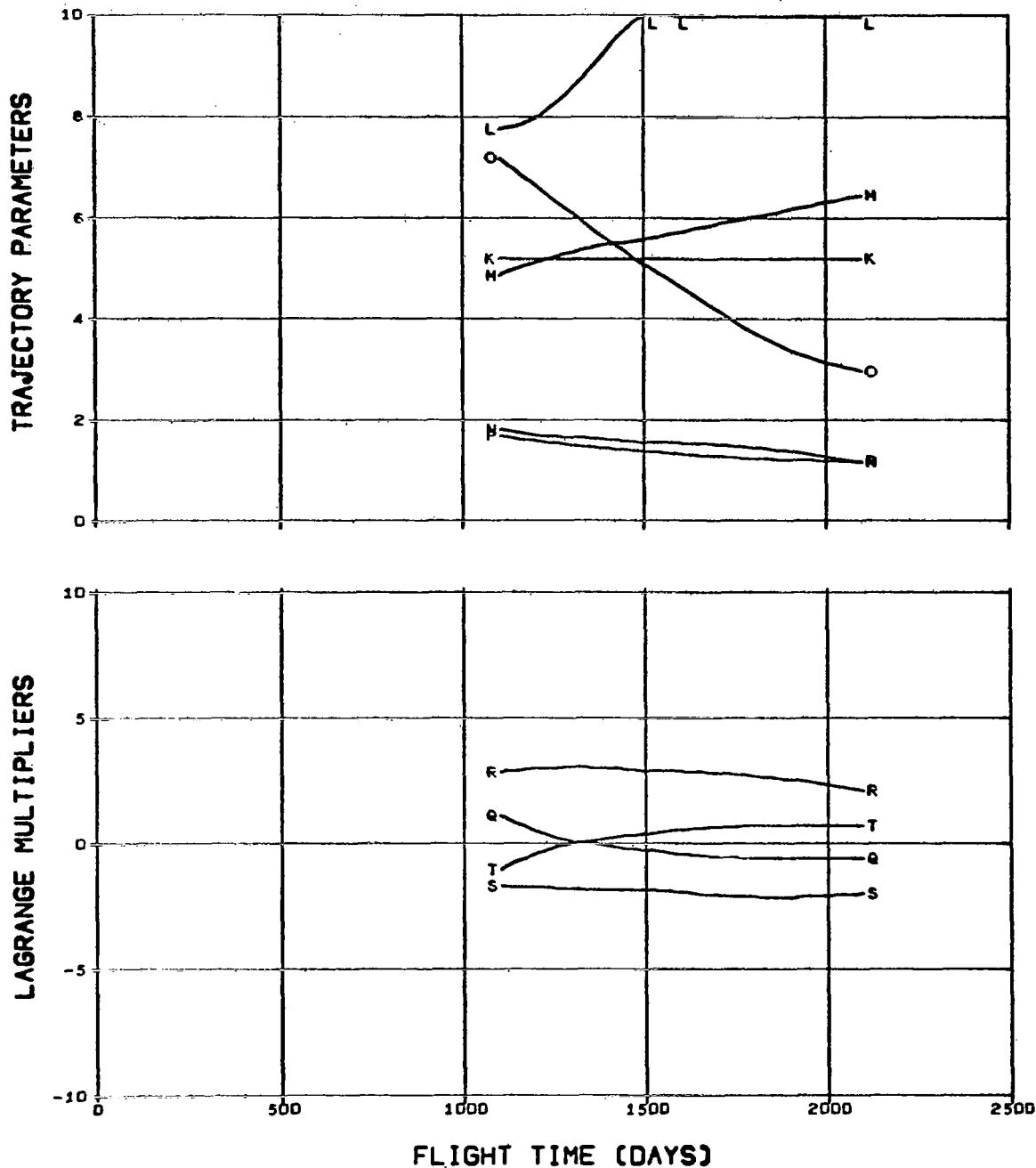
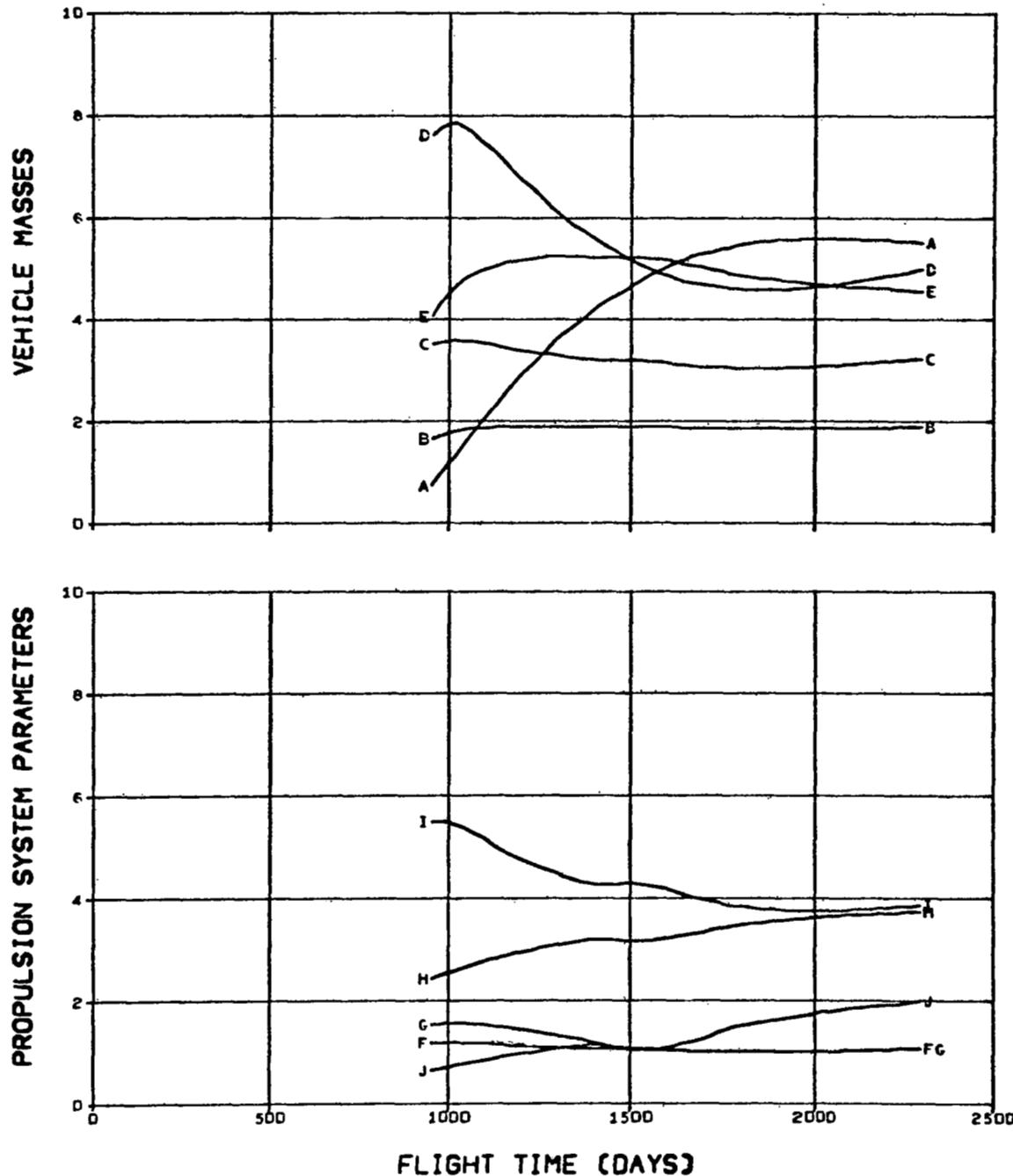


FIG. 5.5.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.5.5 JUPITER MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE

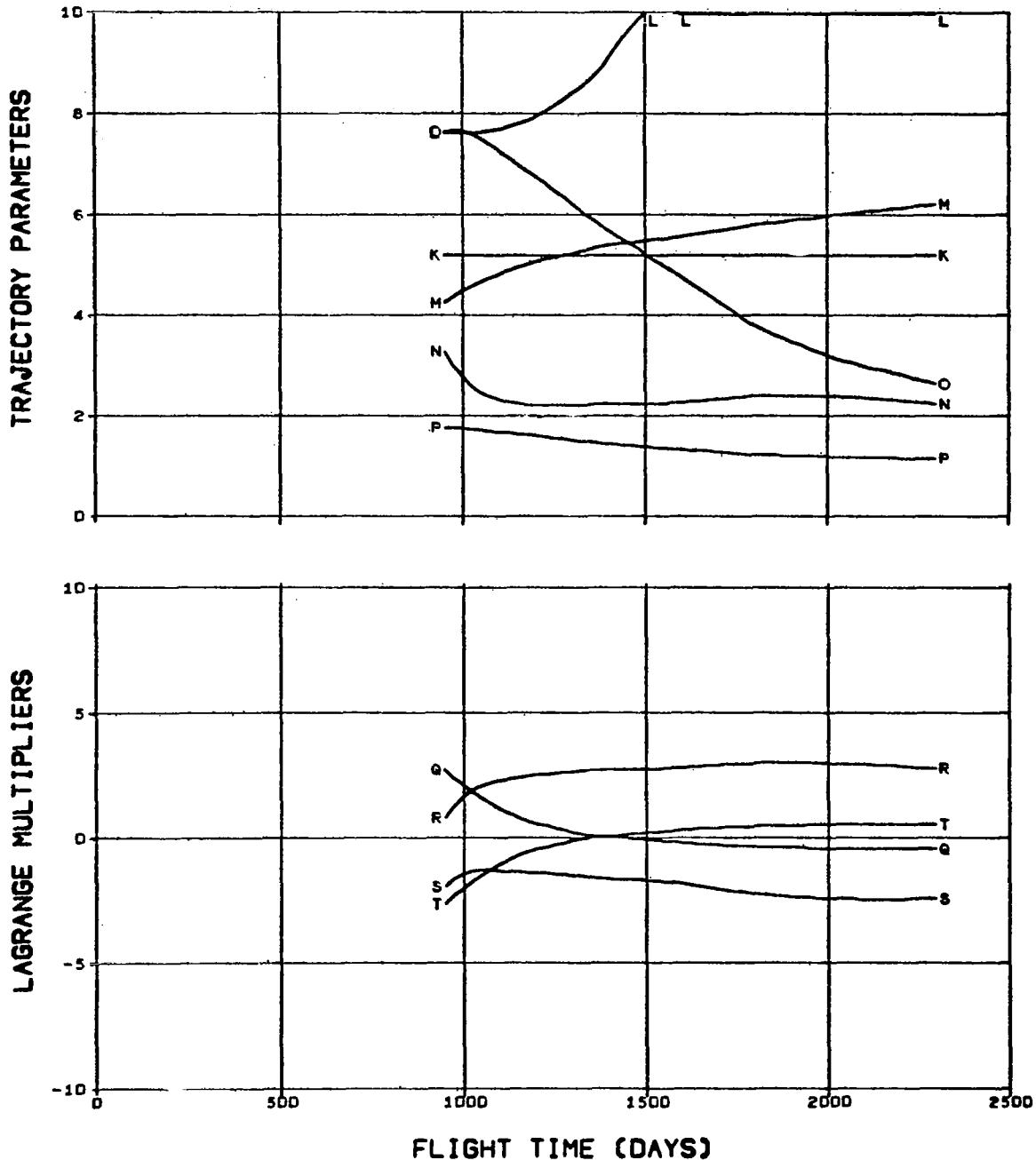


FIG. 5.5.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.00E-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/1000

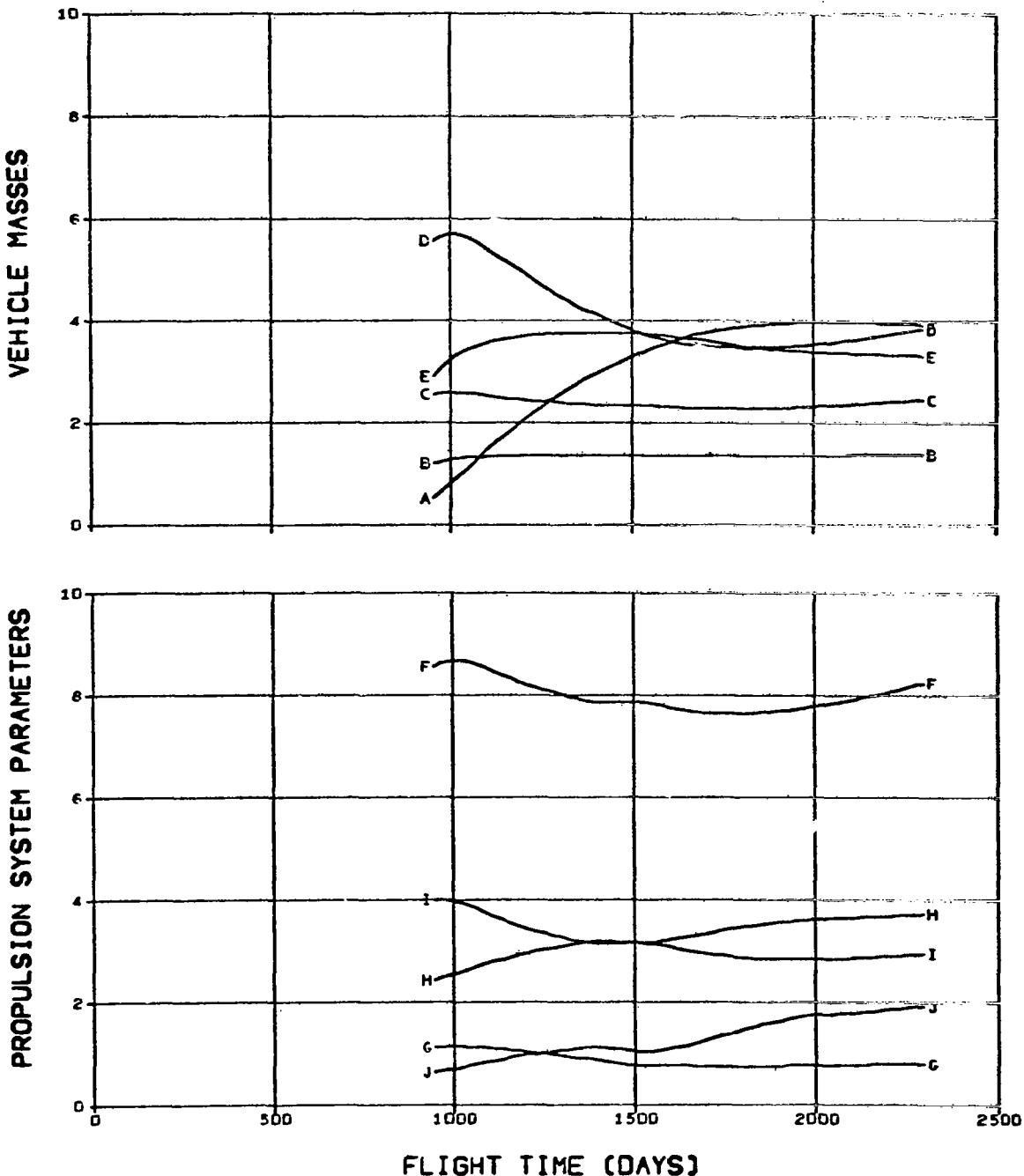


FIG. 5.5.6 JUPITER MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE

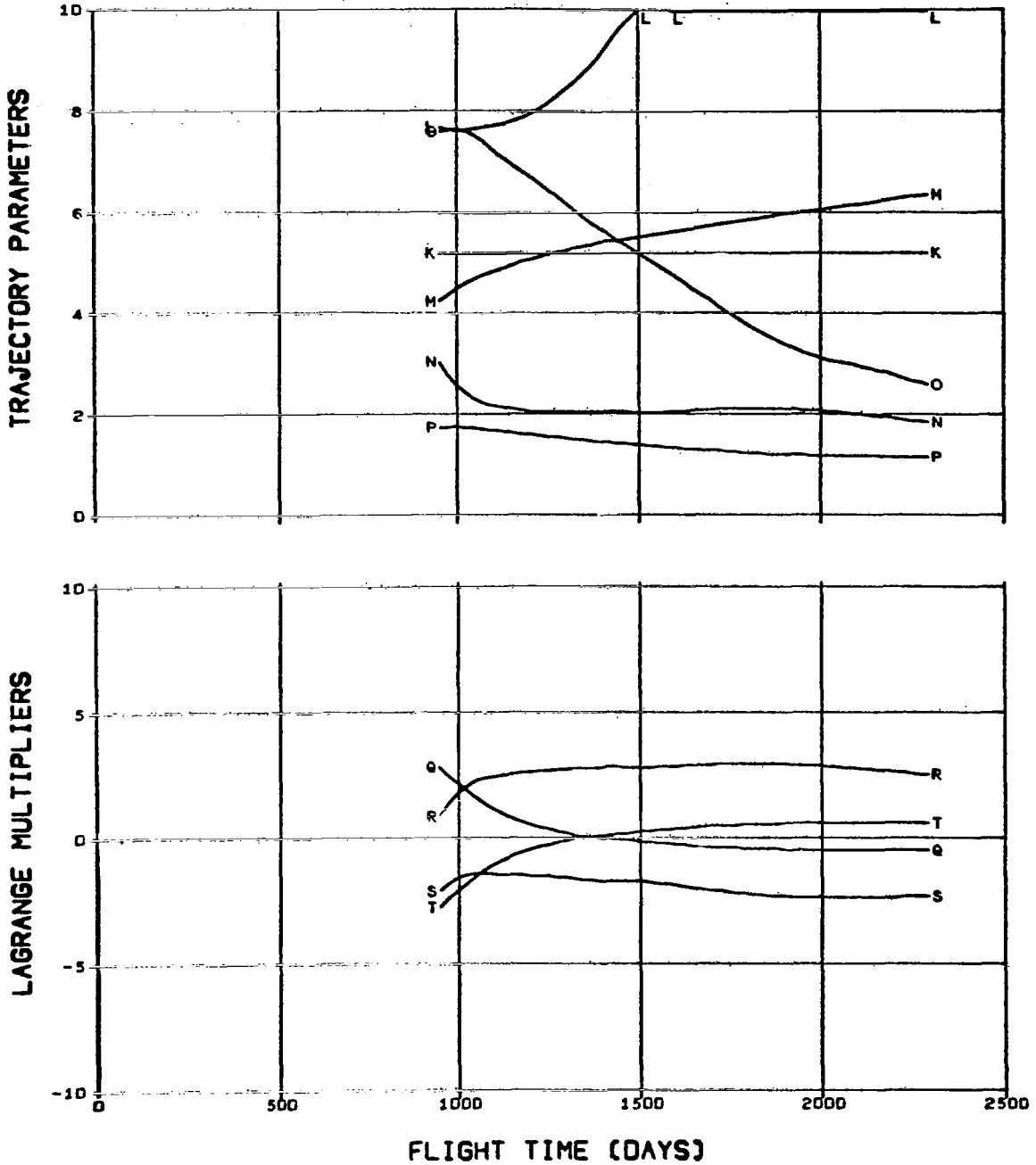
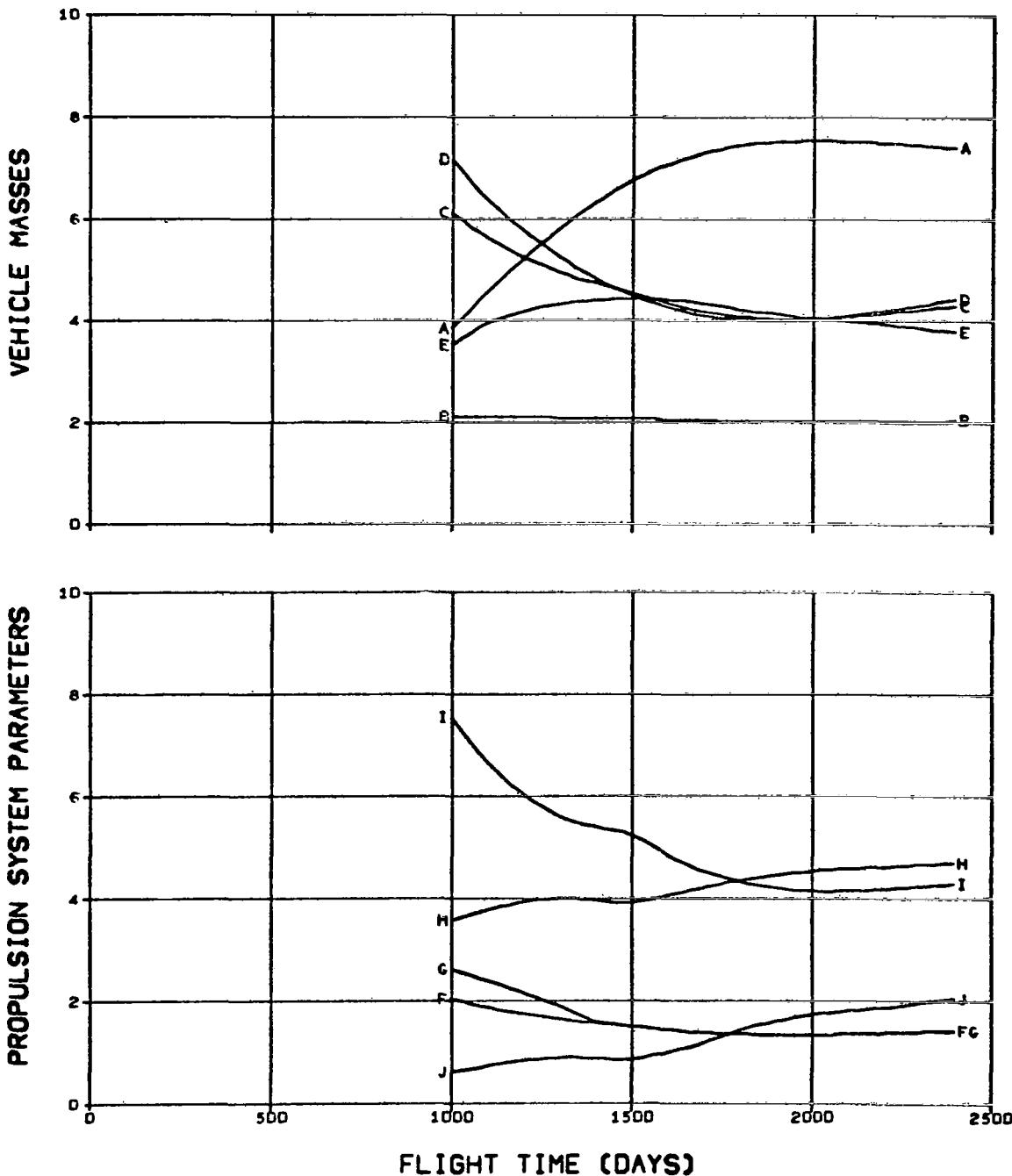


FIG. 5.5.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.6.1 JUPITER MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

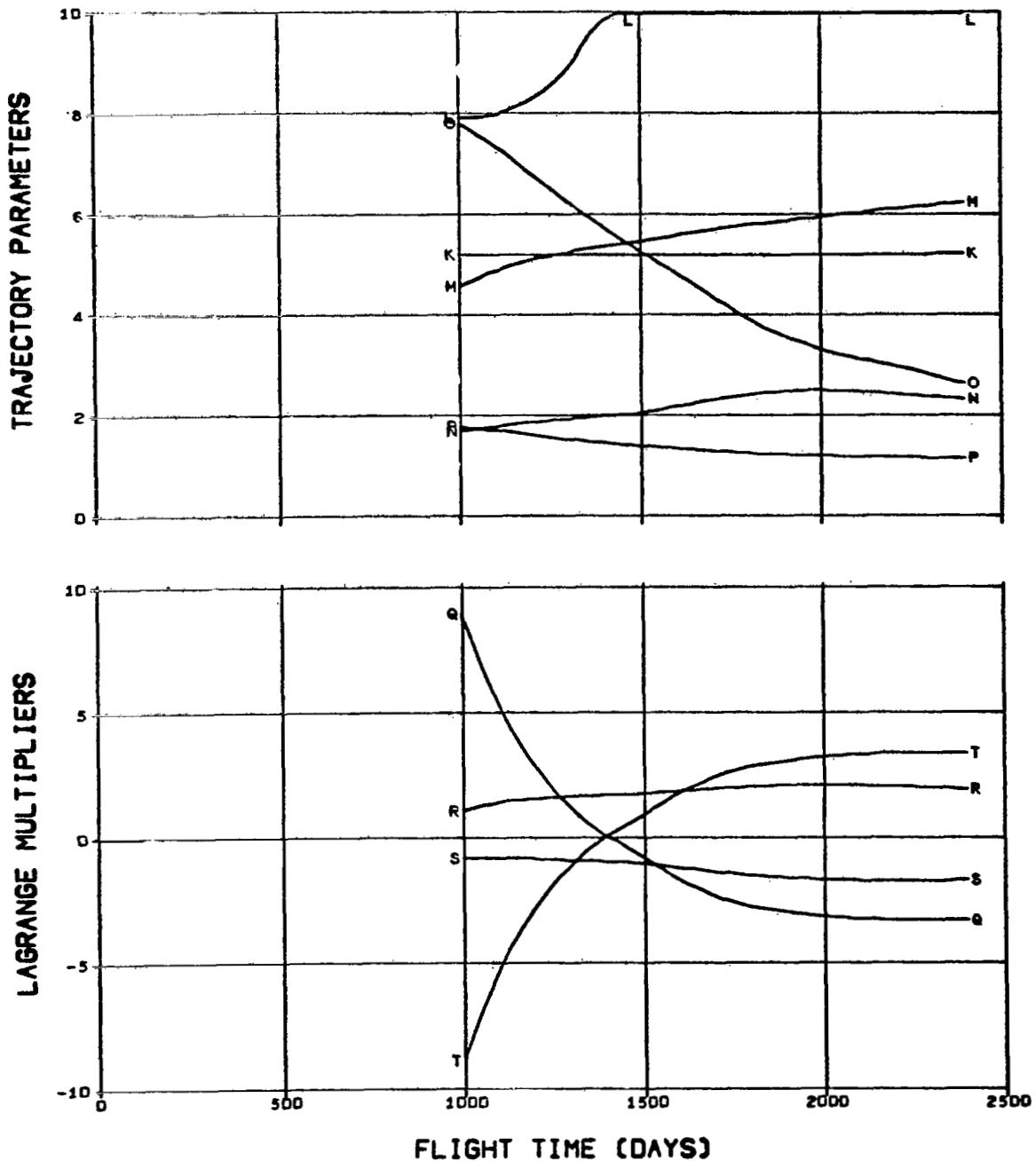
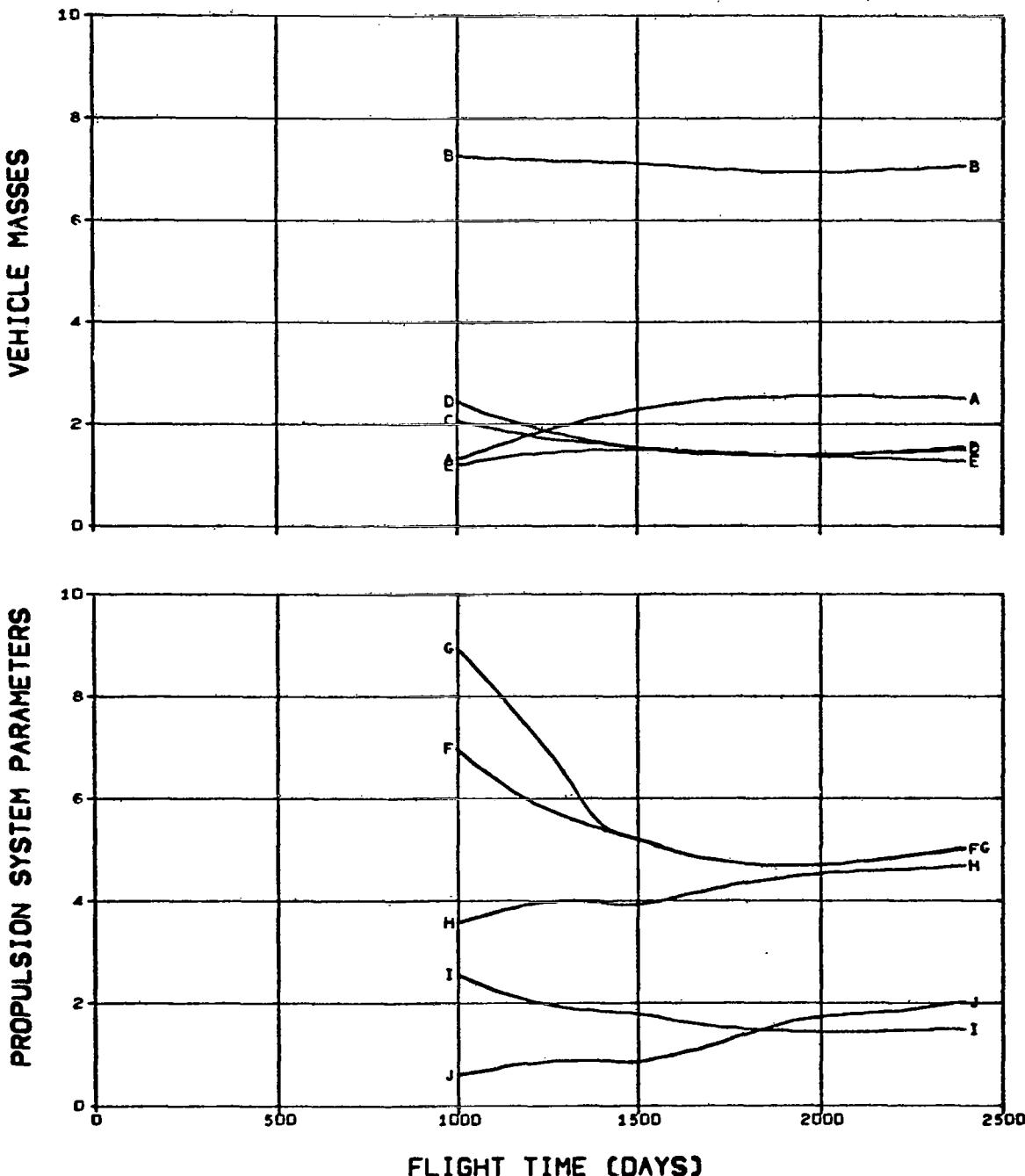


FIG. 5.6.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.6.2 JUPITER MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

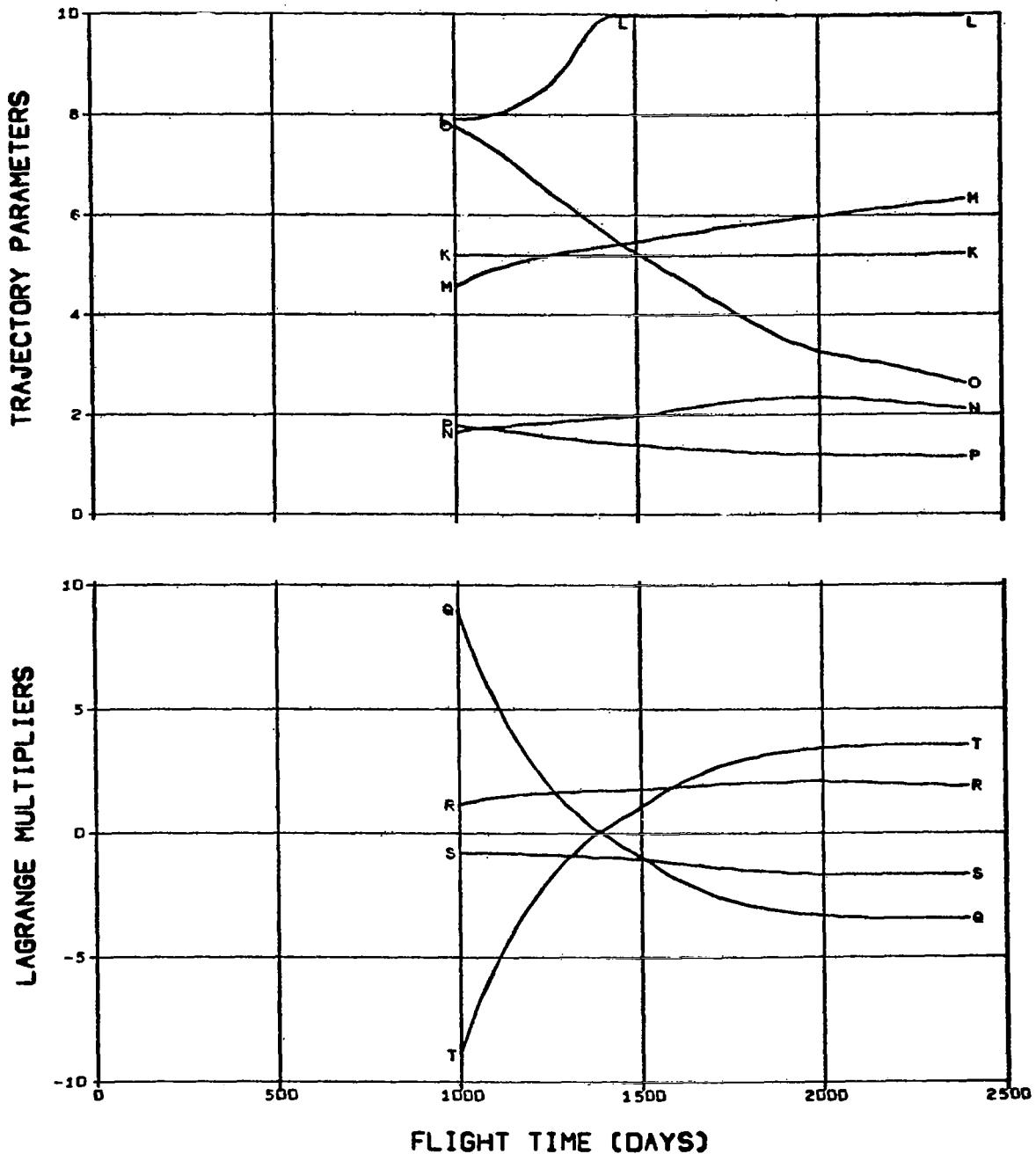
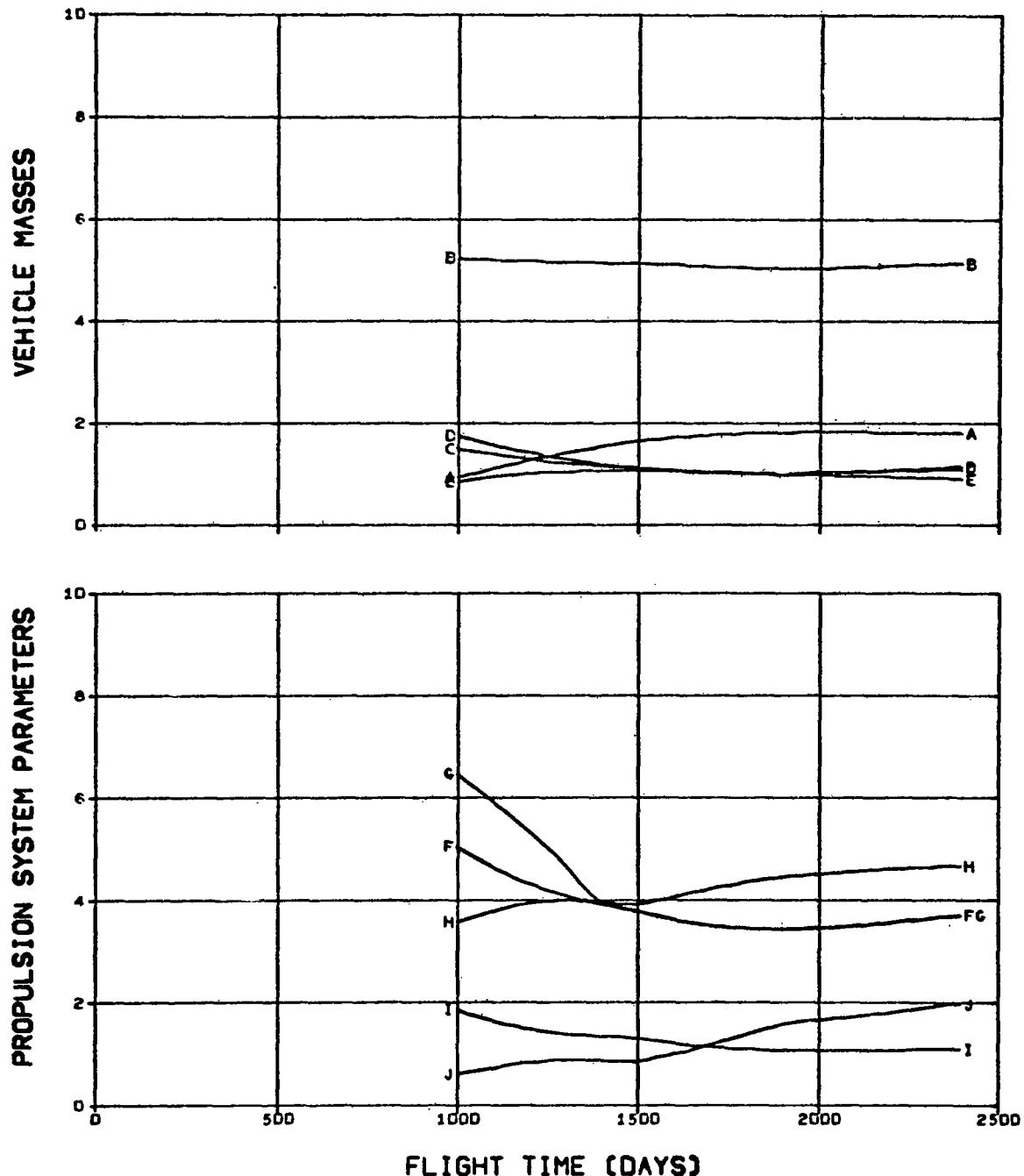


FIG. 5.6.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 5.6.3 JUPITER MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPELUSION SYSTEM JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

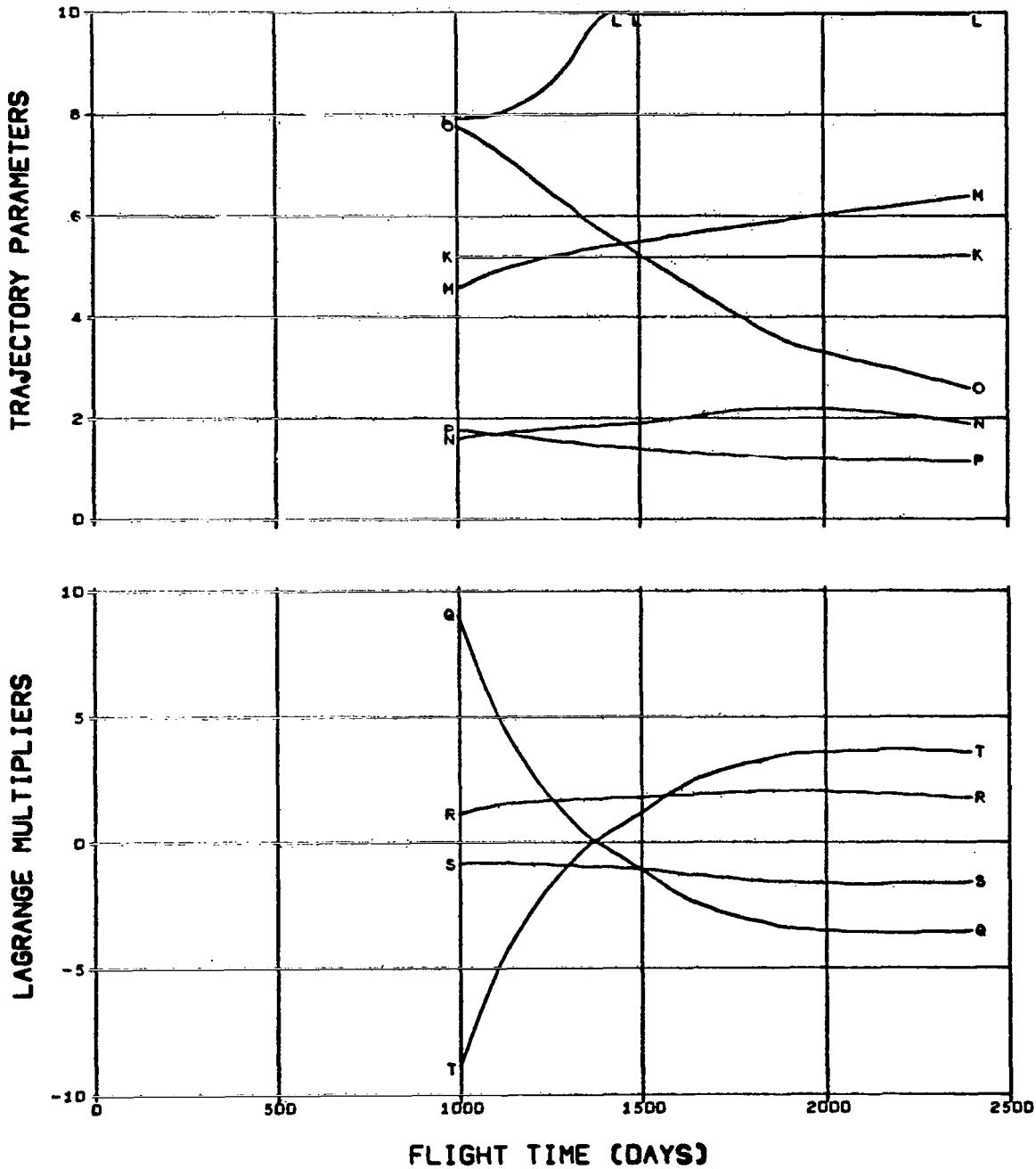


FIG. 5.6.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

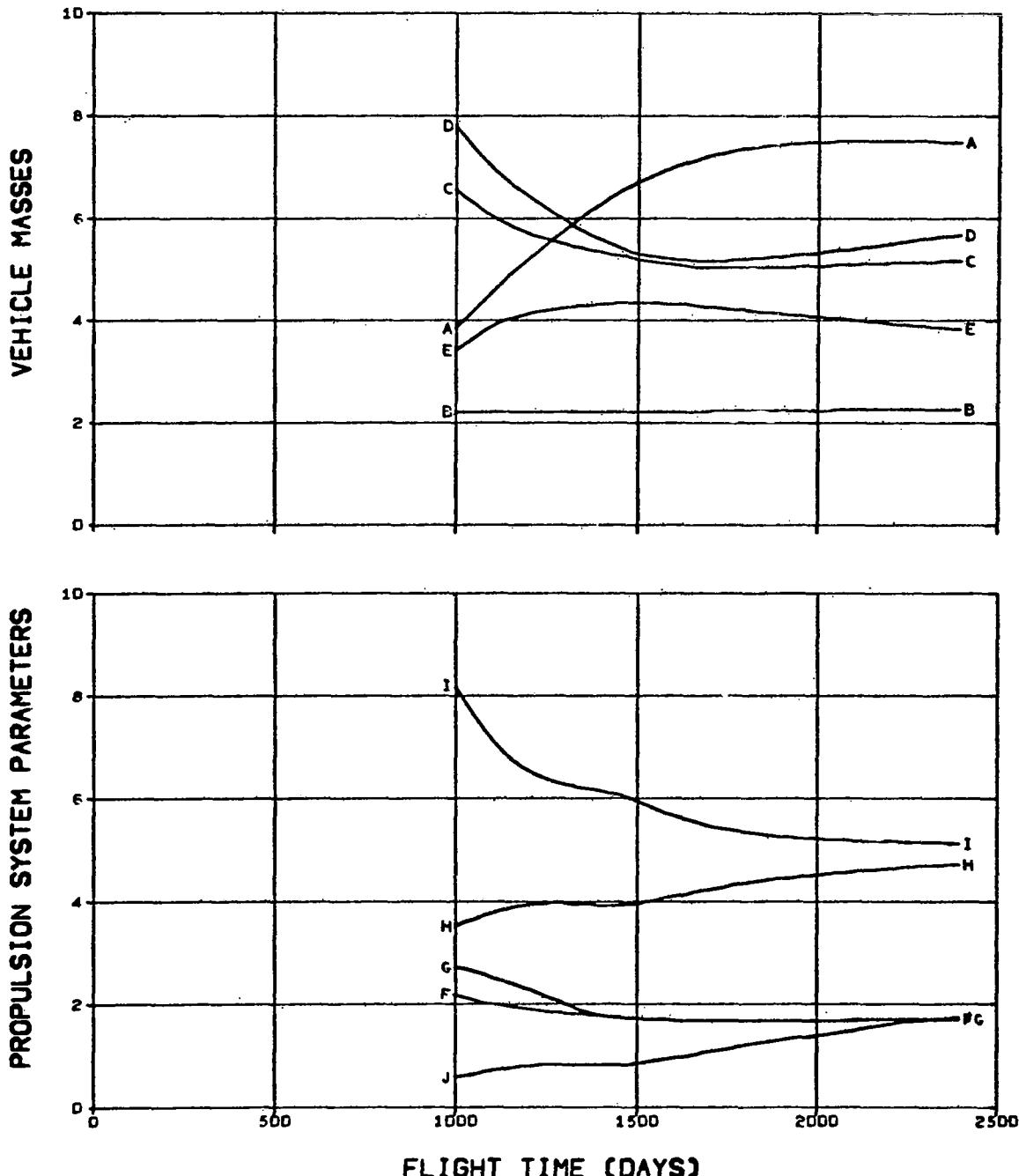


FIG. 5.6.4 JUPITER MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/100
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

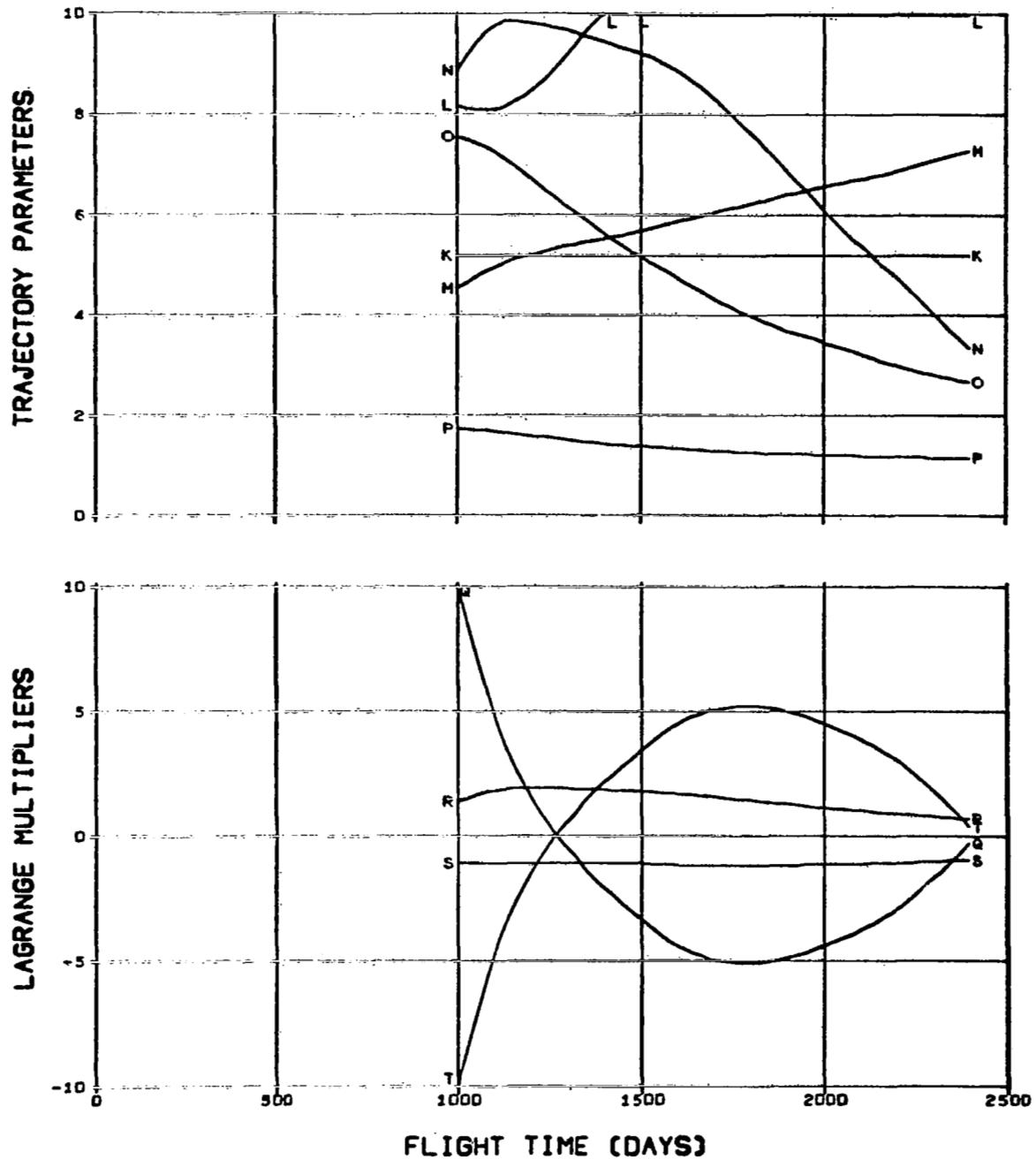


FIG. 5.6.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

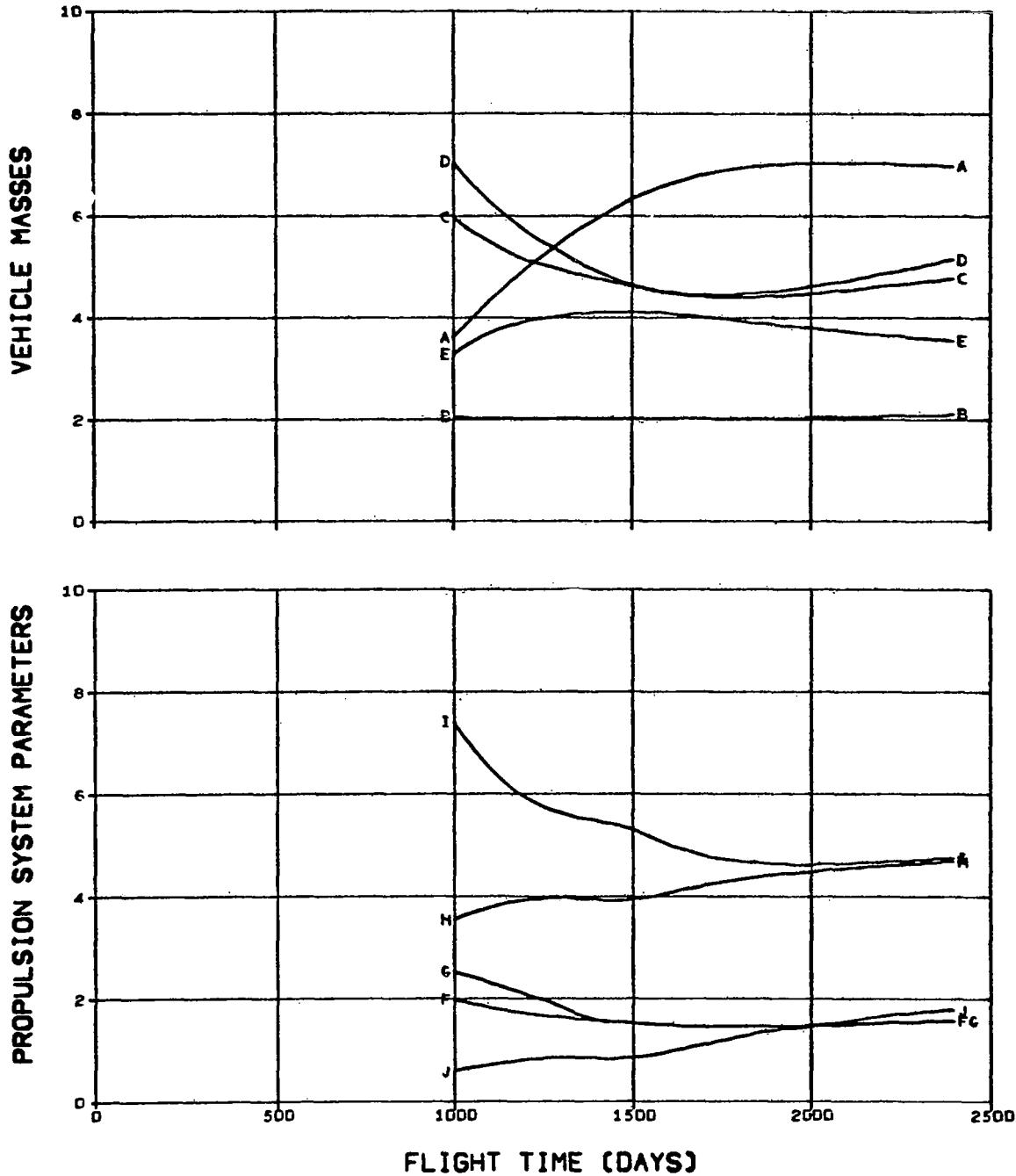


FIG. 5.6.5 JUPITER MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEC)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

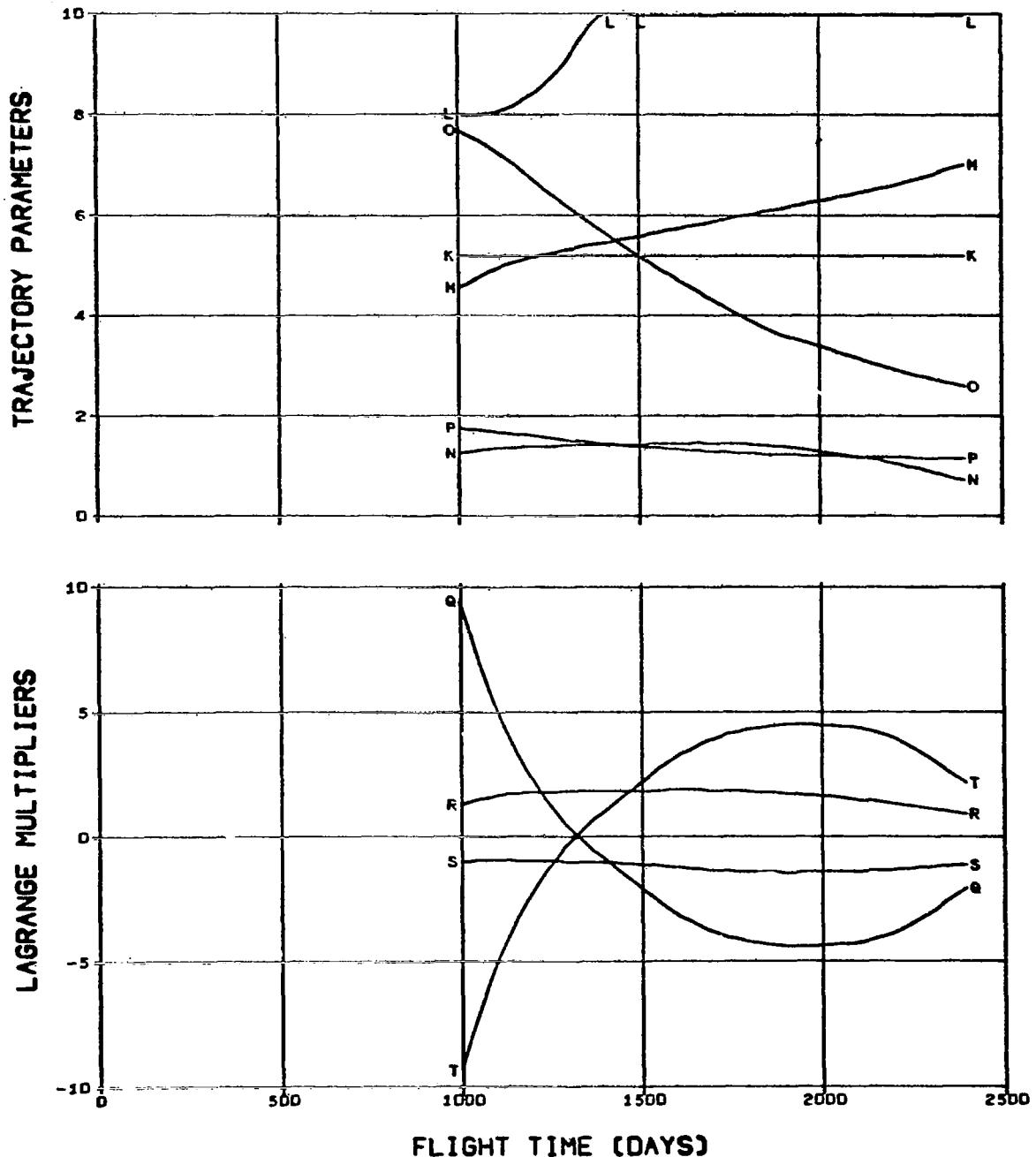
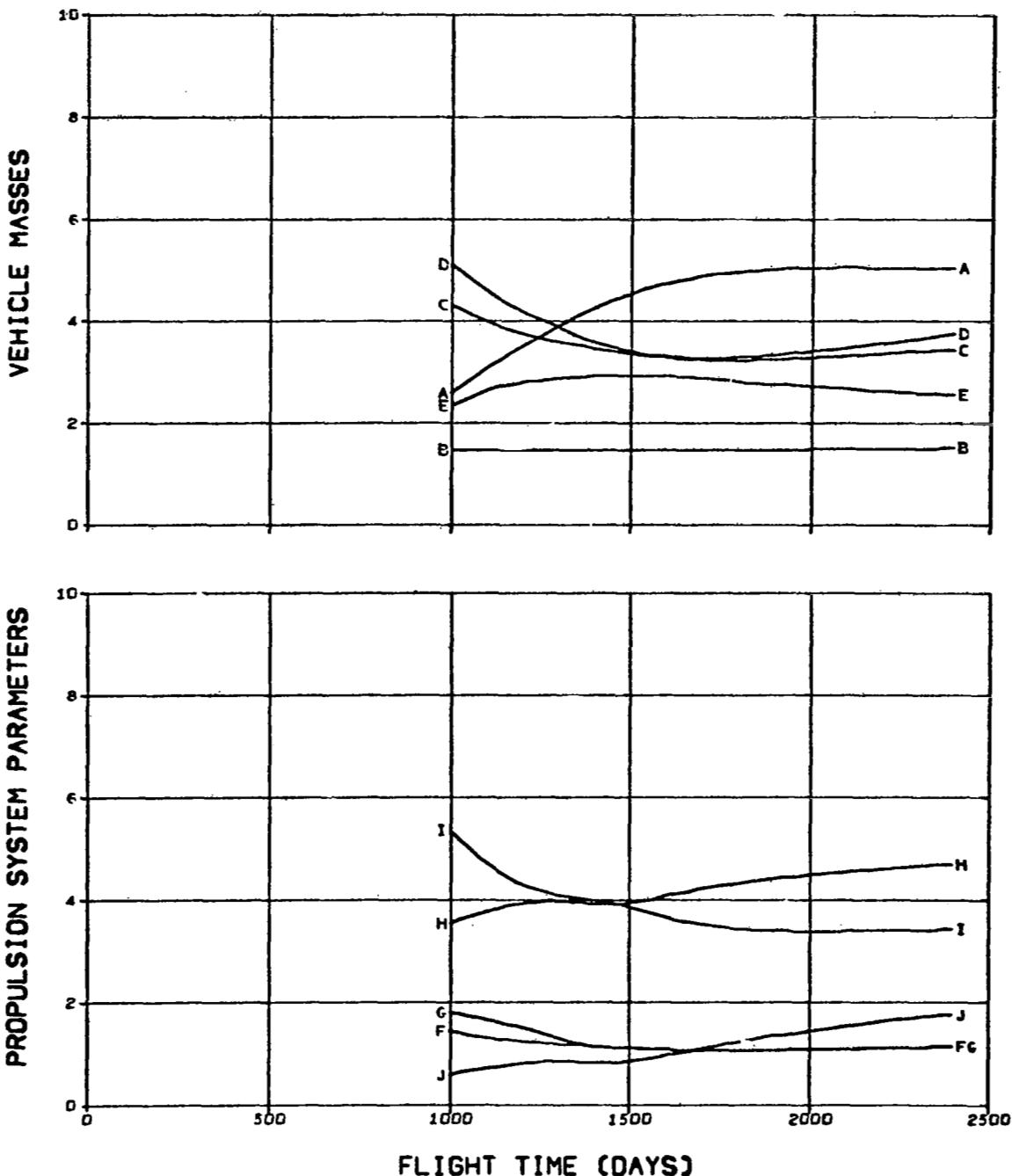


FIG. 5.6.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.00E-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/1000



**FIG. 5.6.6 JUPITER MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

N MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.00E-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

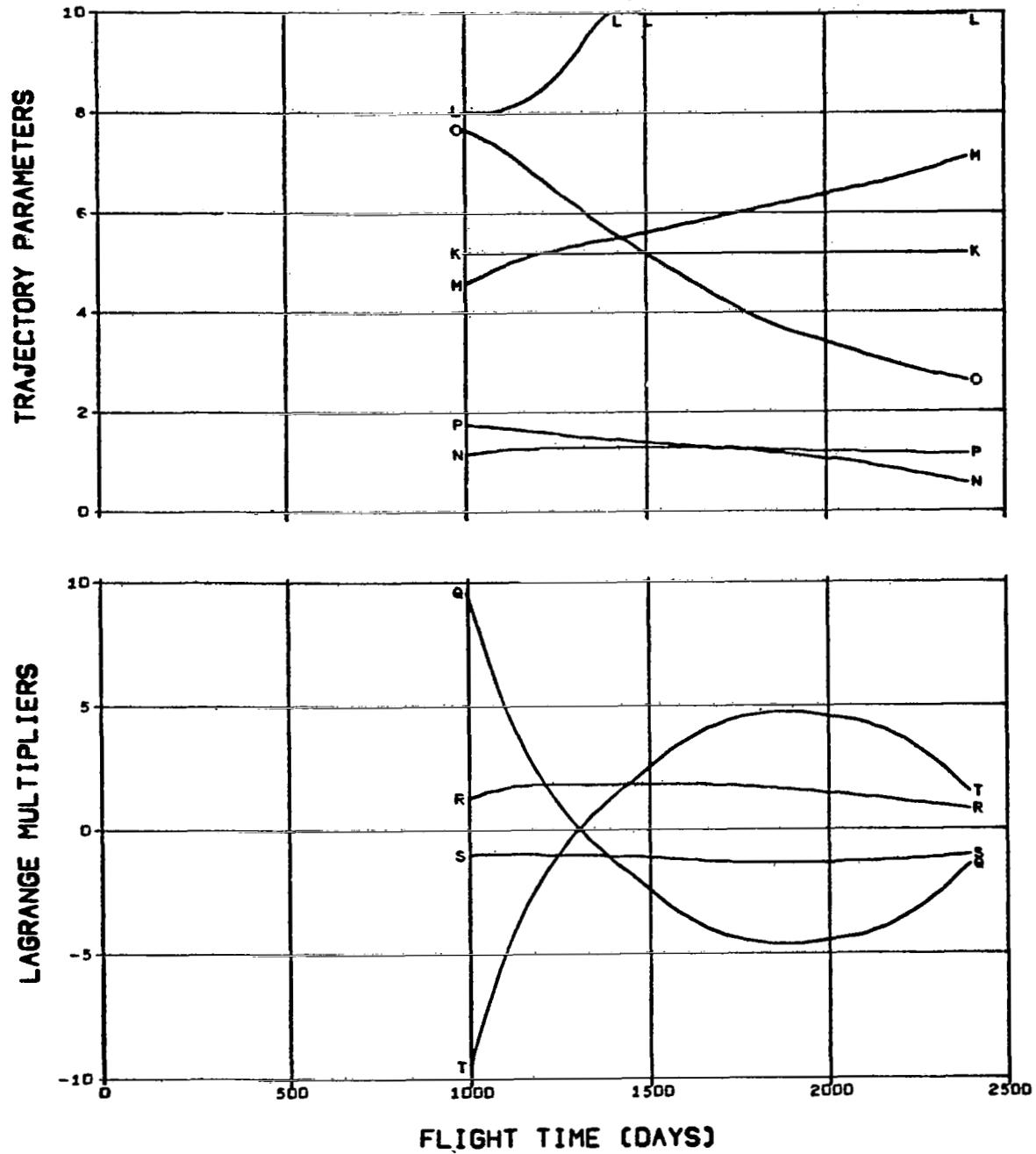


FIG. 5.6.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/100

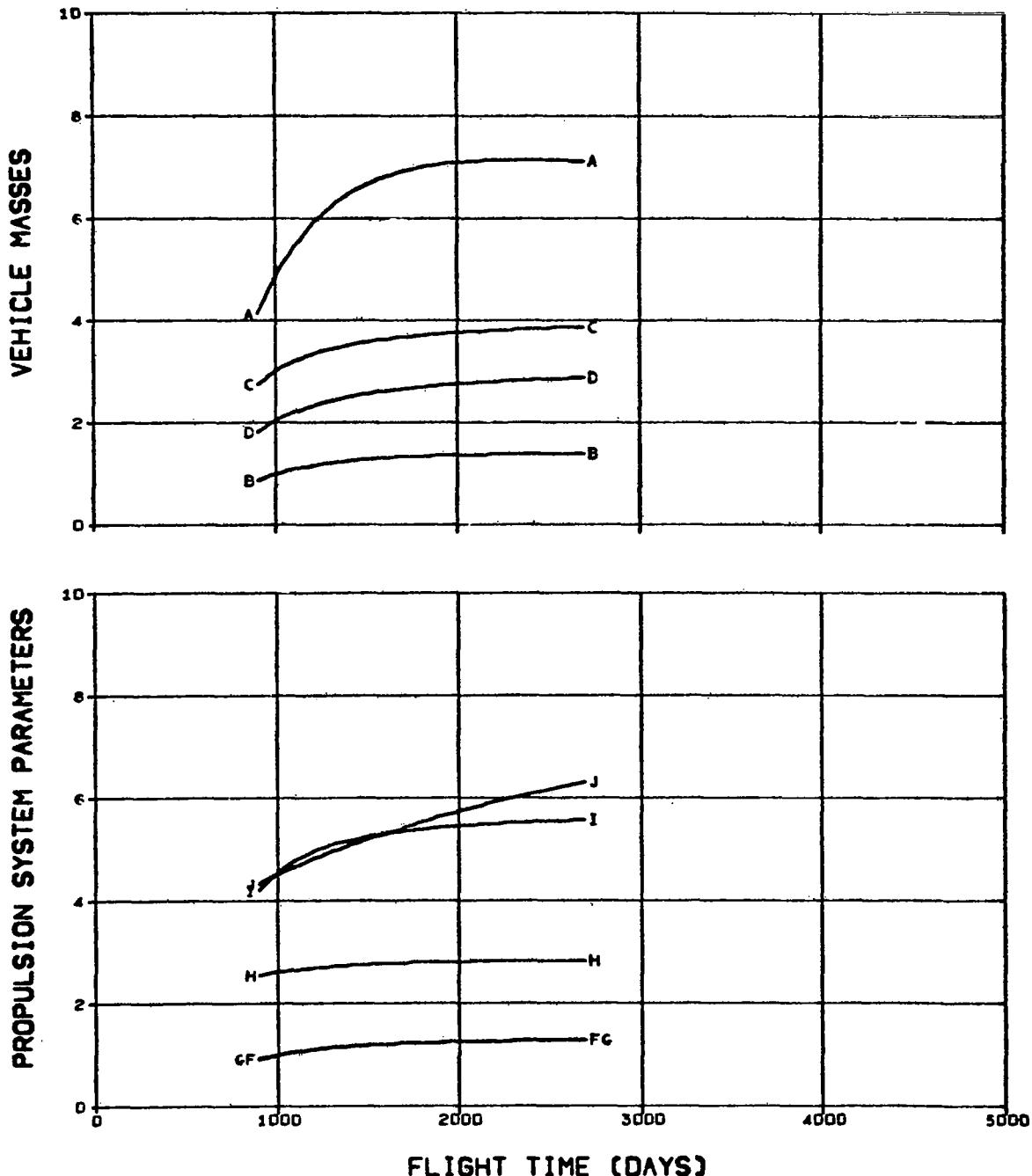


FIG. 6.1.1 SATURN MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.00E-1
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

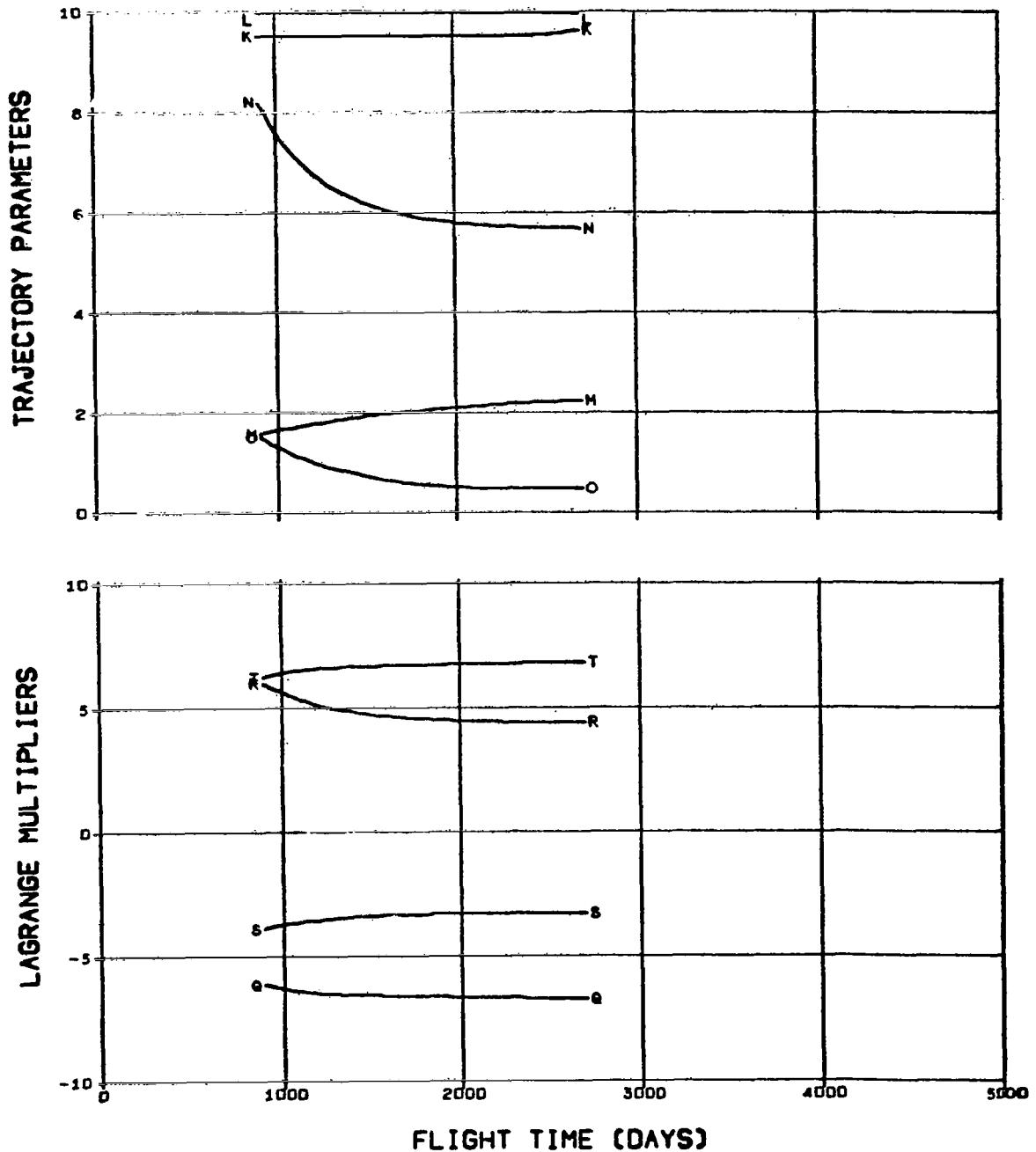


FIG. 6.1.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLENT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/100

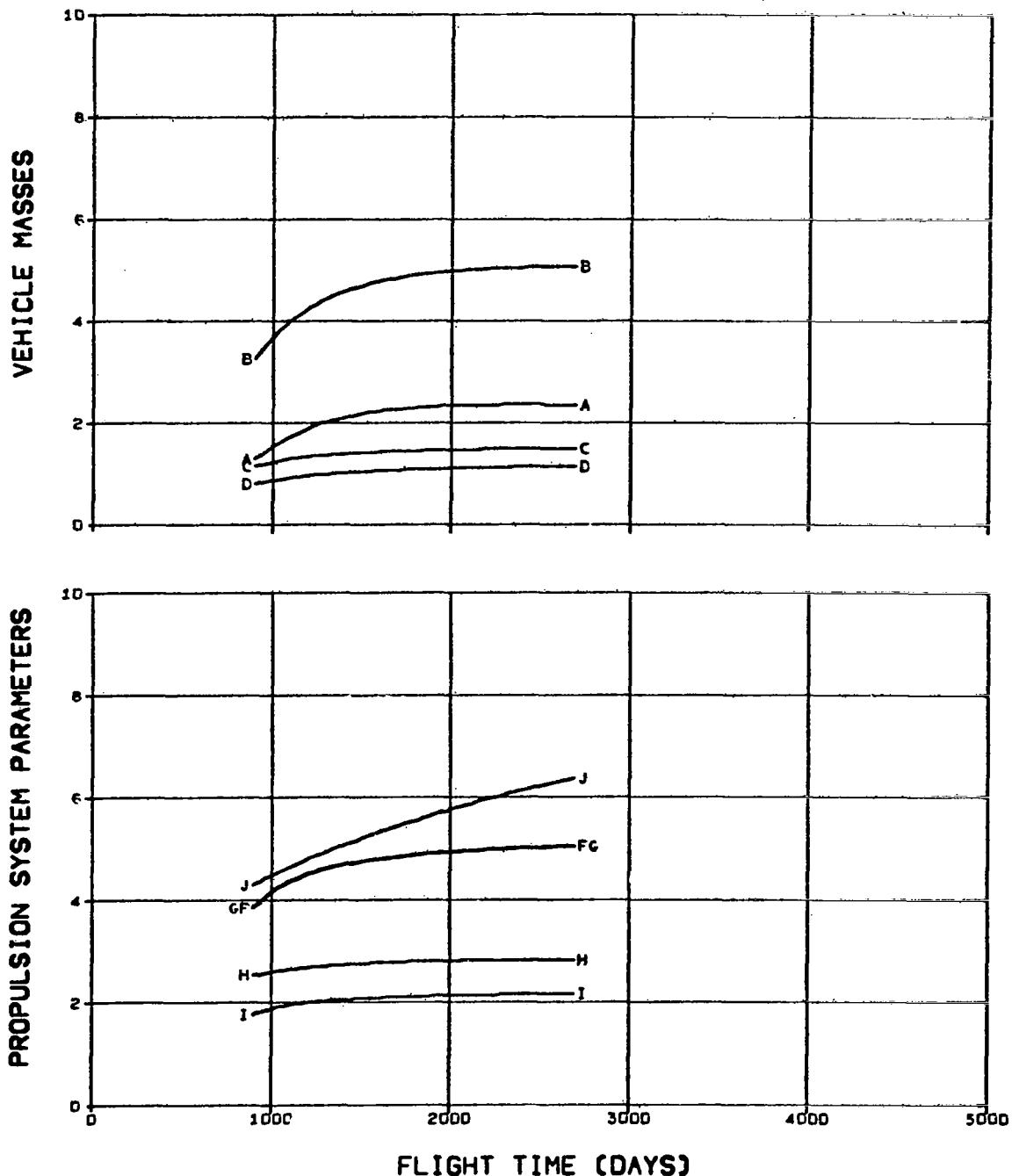


FIG. 6.1.2 SATURN MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

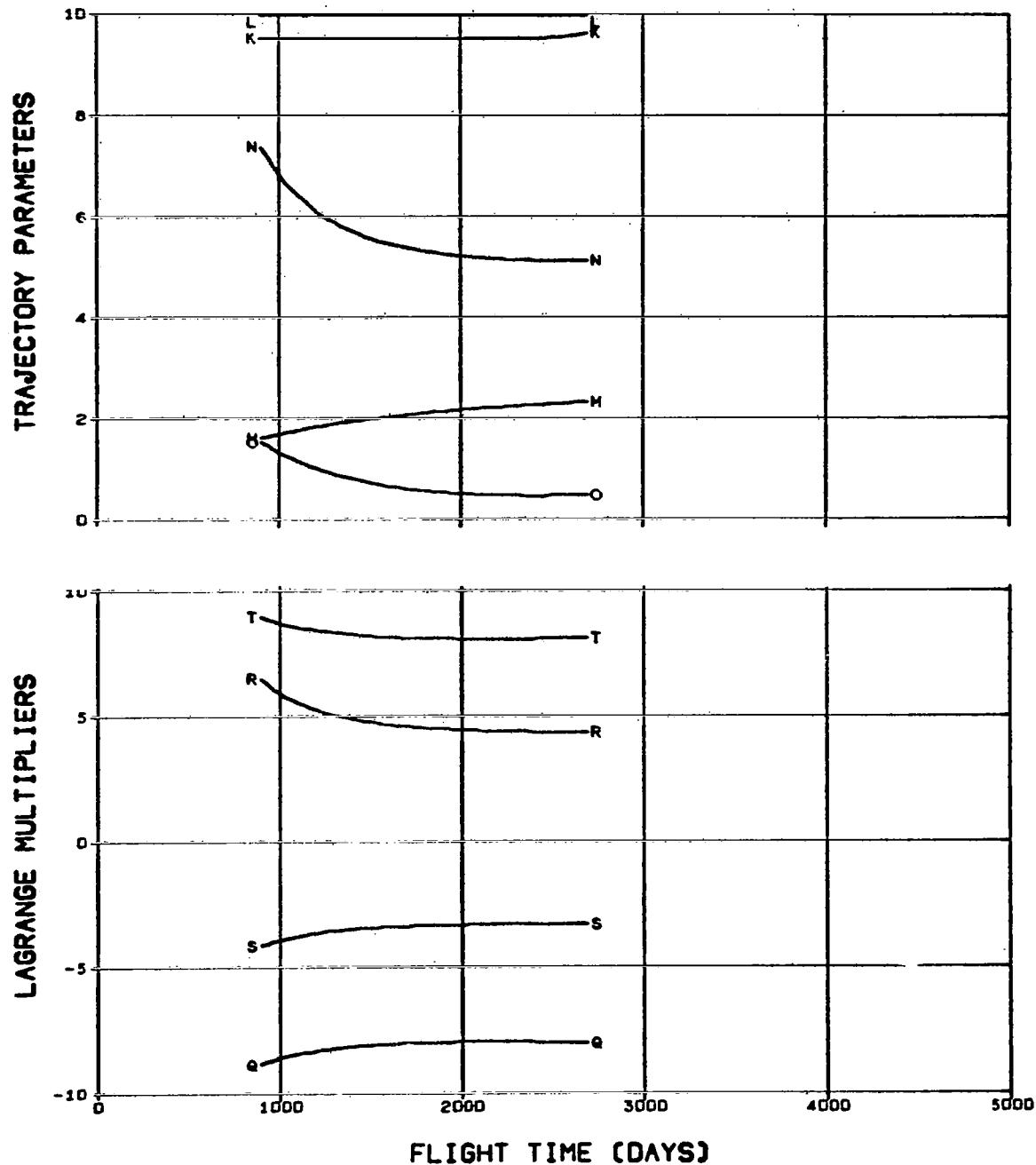


FIG. 6.1.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPULSION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

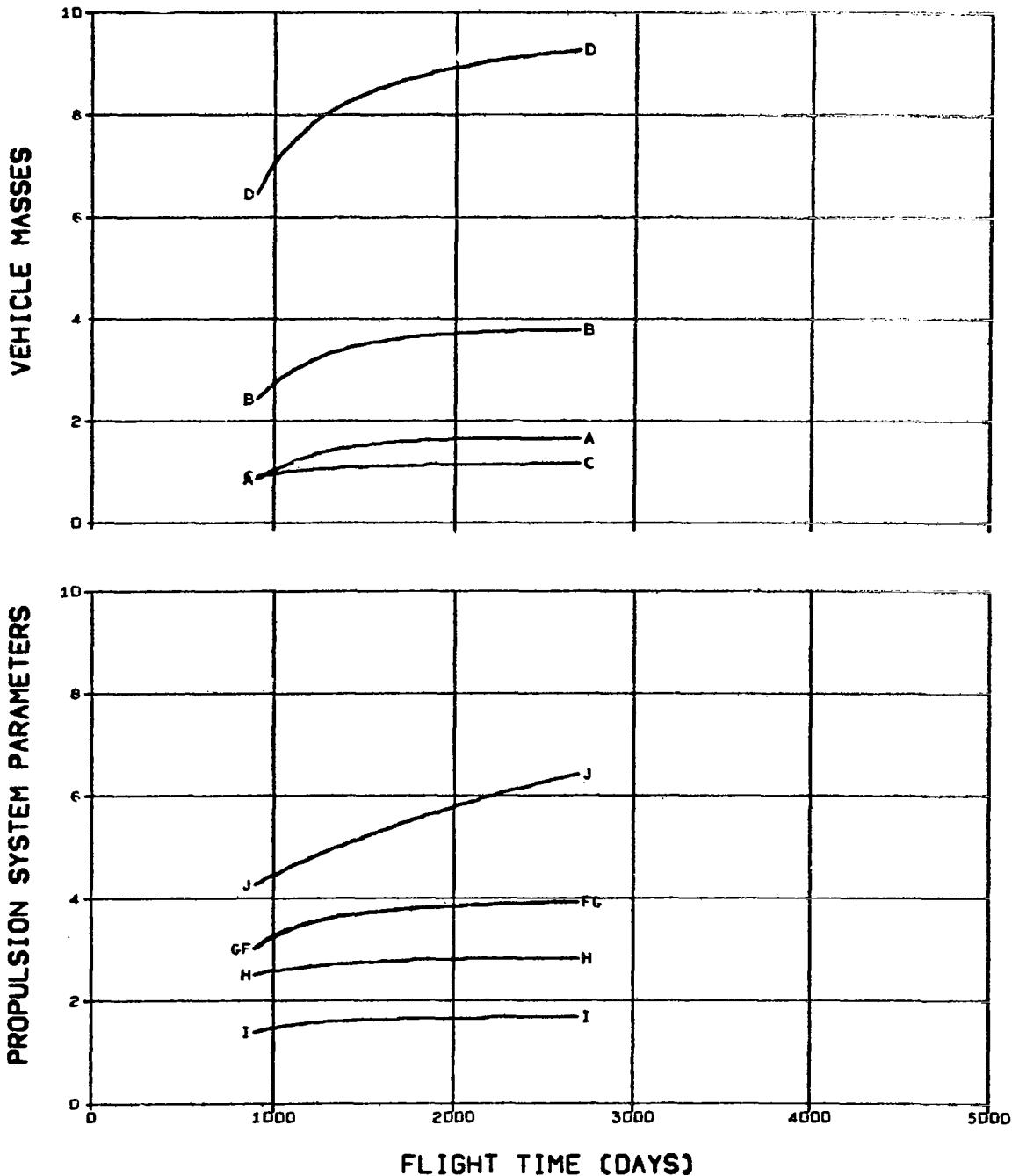


FIG. 6.1.3 SATURN MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEC)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

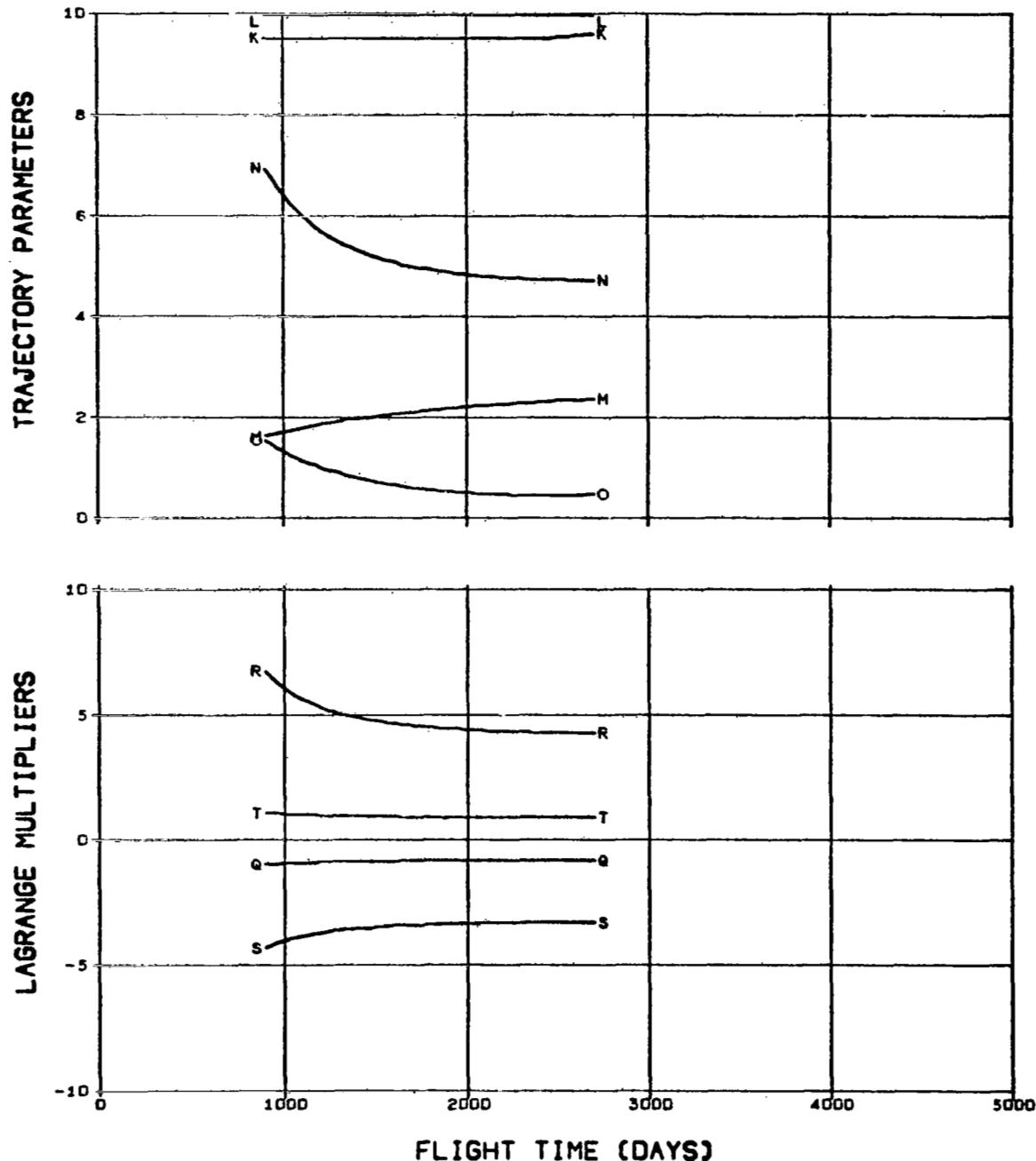


FIG. 6.1.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)
	J PROPULSION TIME (DAYS)/100

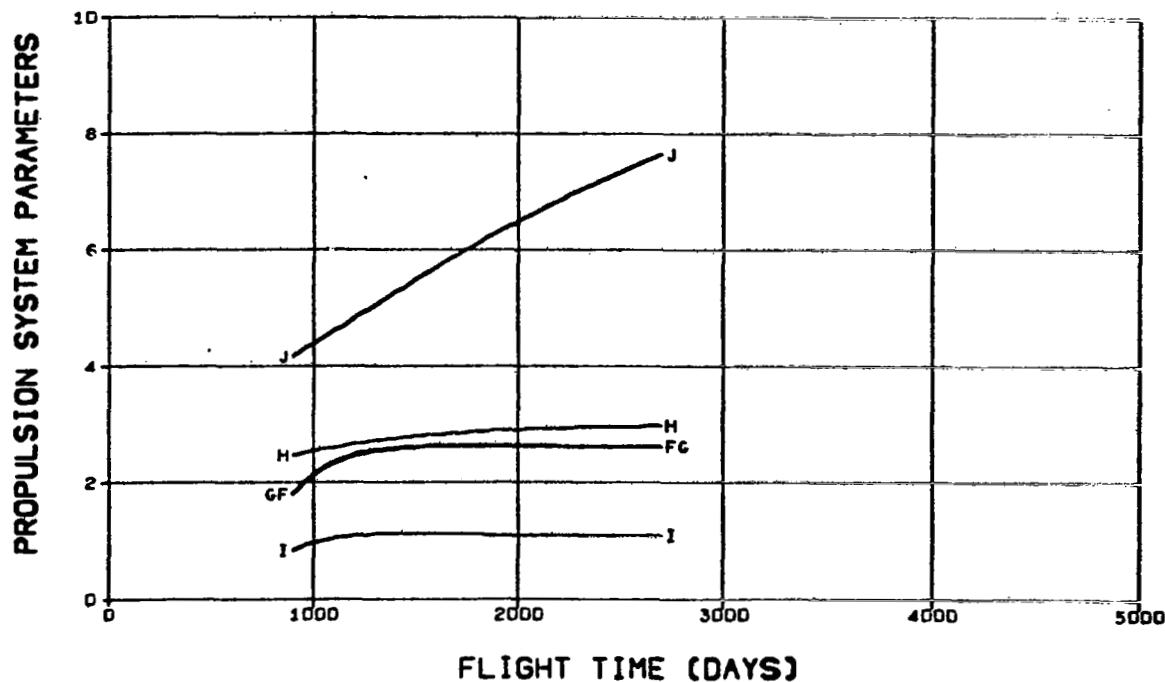
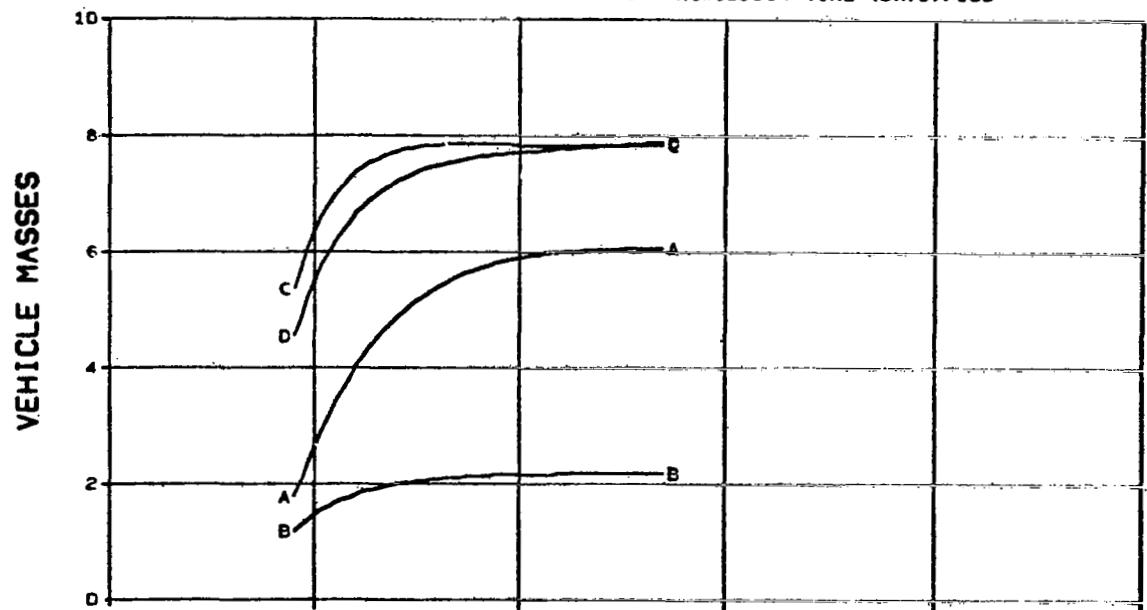


FIG. 6.1.4 SATURN MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

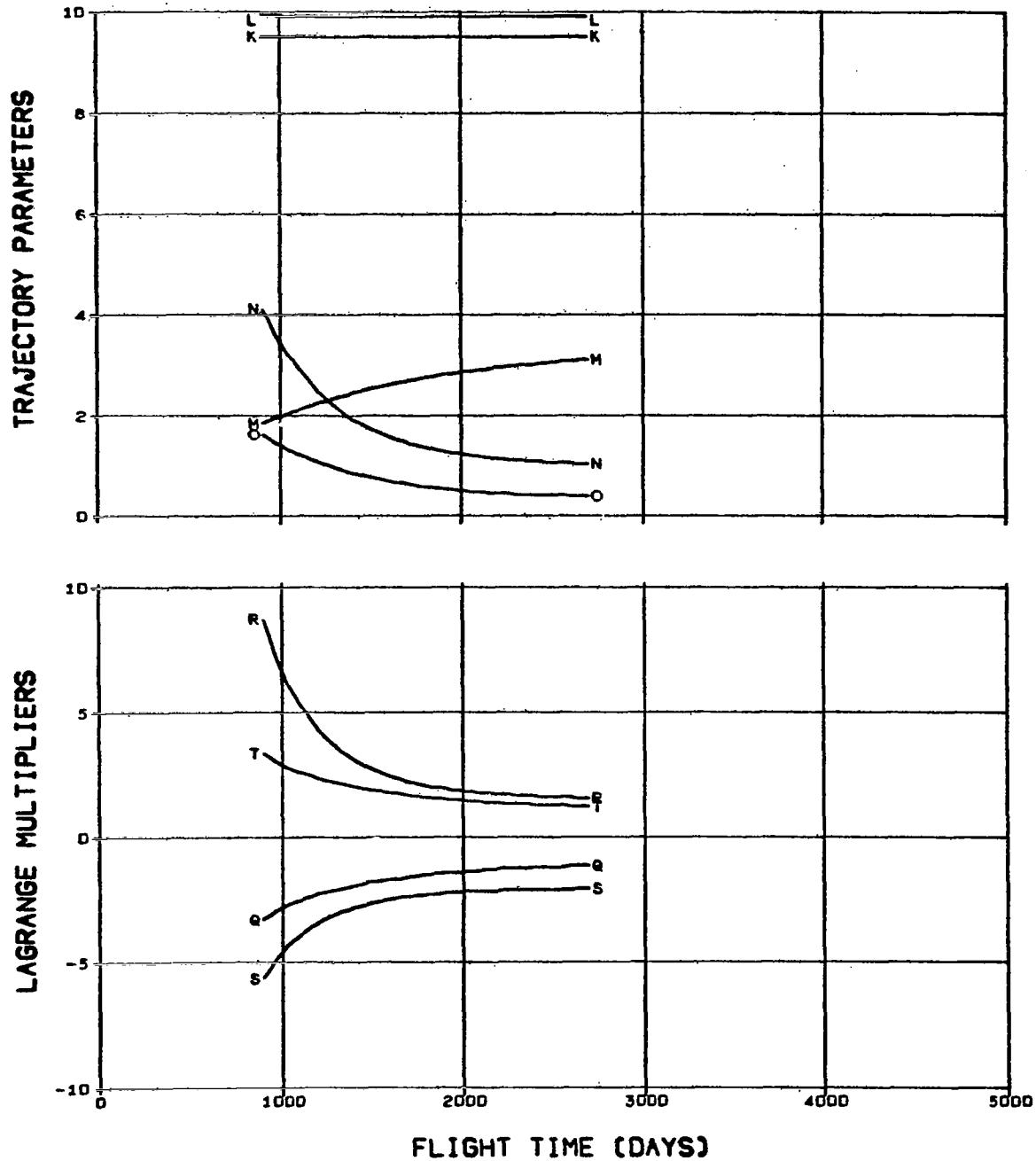


FIG. 6.1.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.00E-1
	J PROPULSION TIME (DAYS)/100

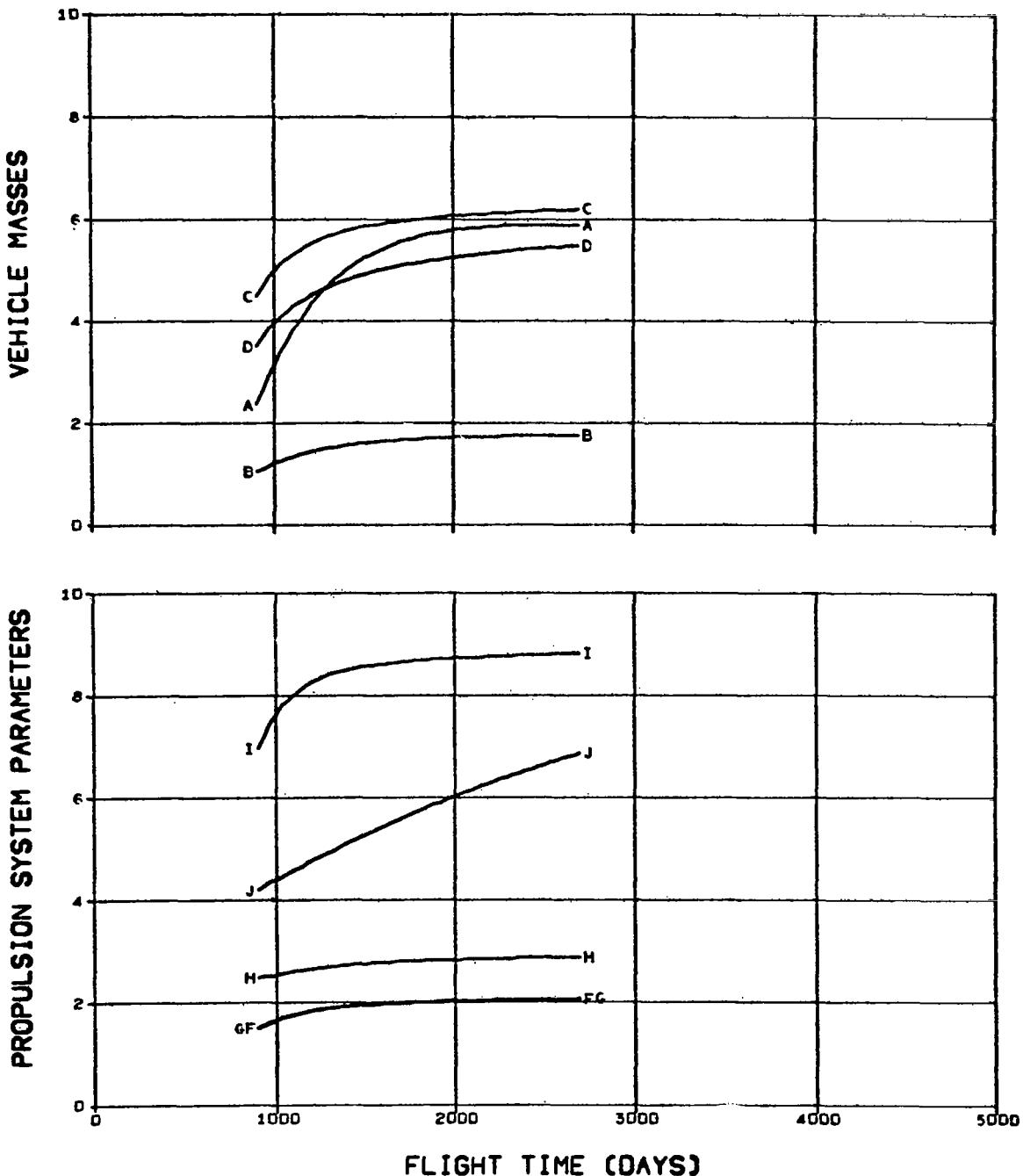


FIG. 6.1.5 SATURN MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.DOE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

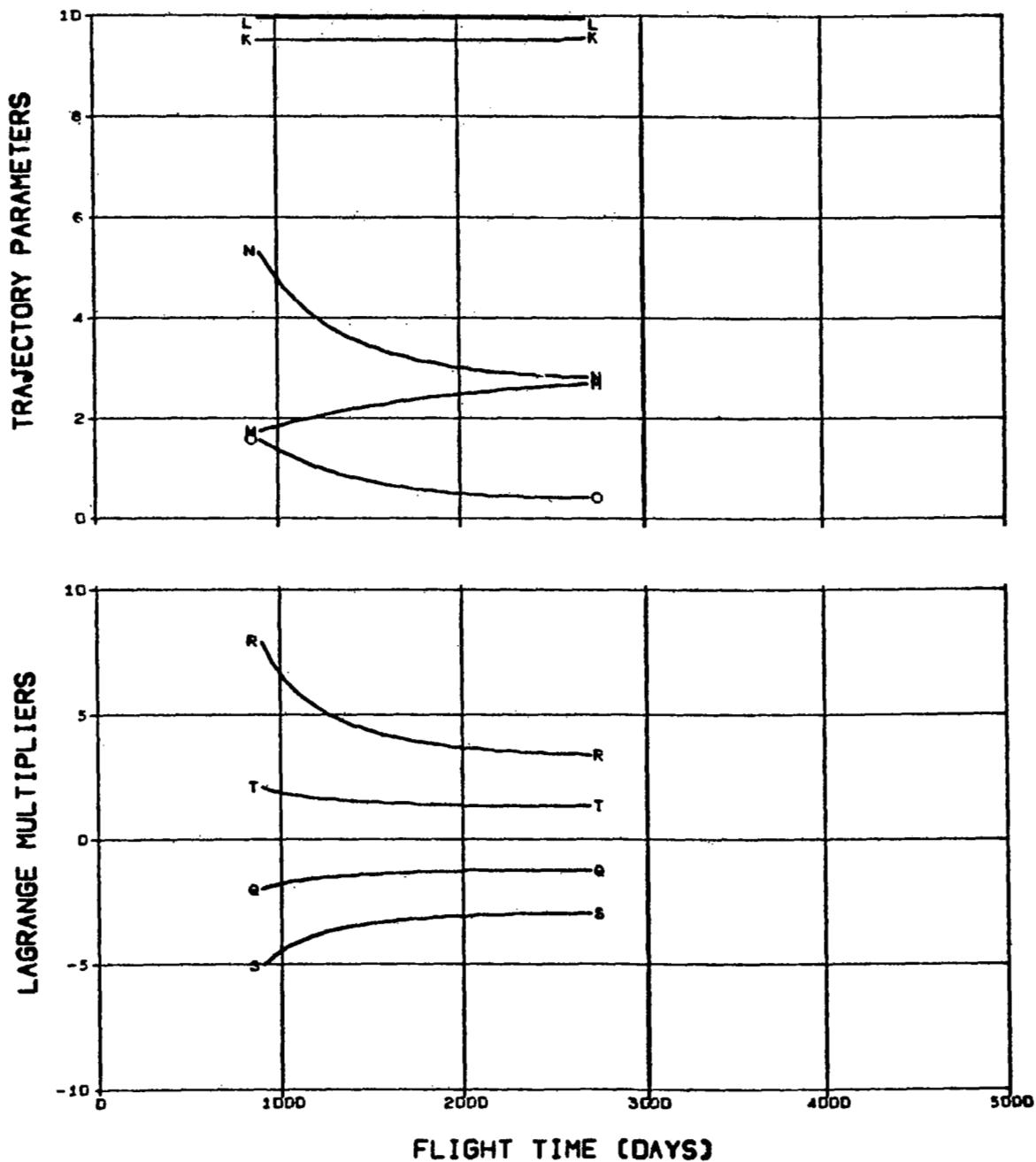


FIG. 6.1.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPULSION TIME (DAYS)/100

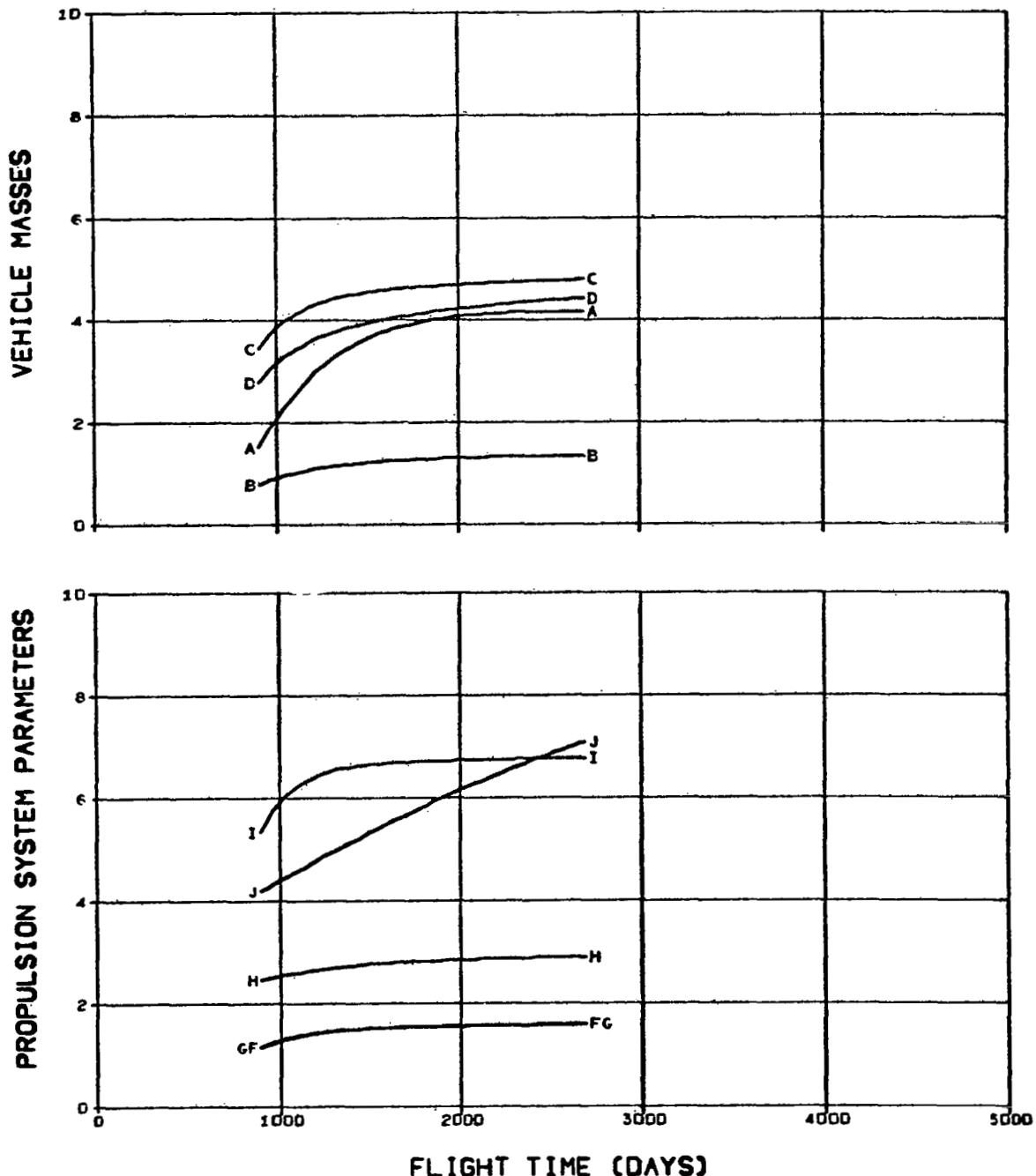


FIG. 6.1.6 SATURN MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

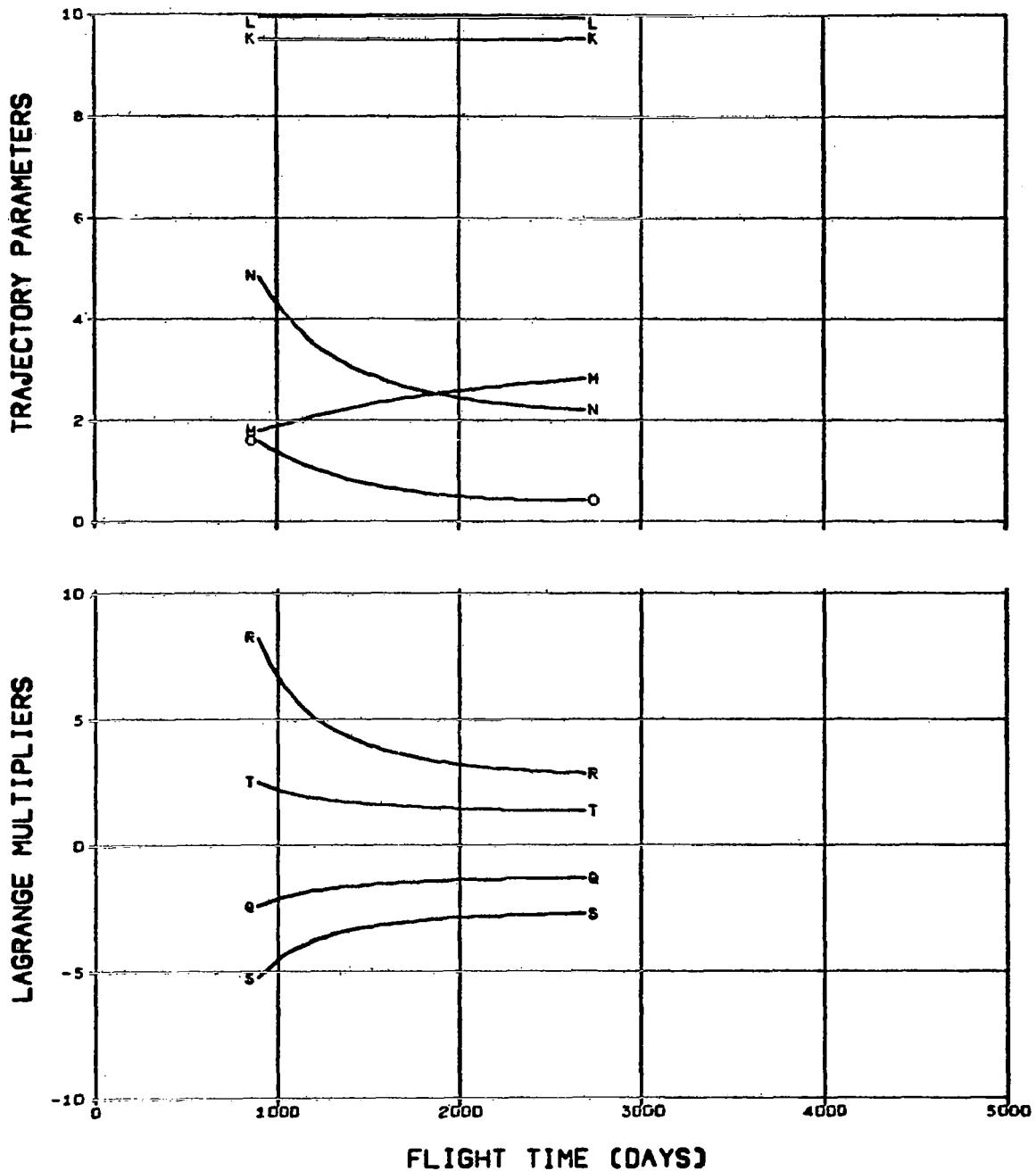


FIG. 6.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

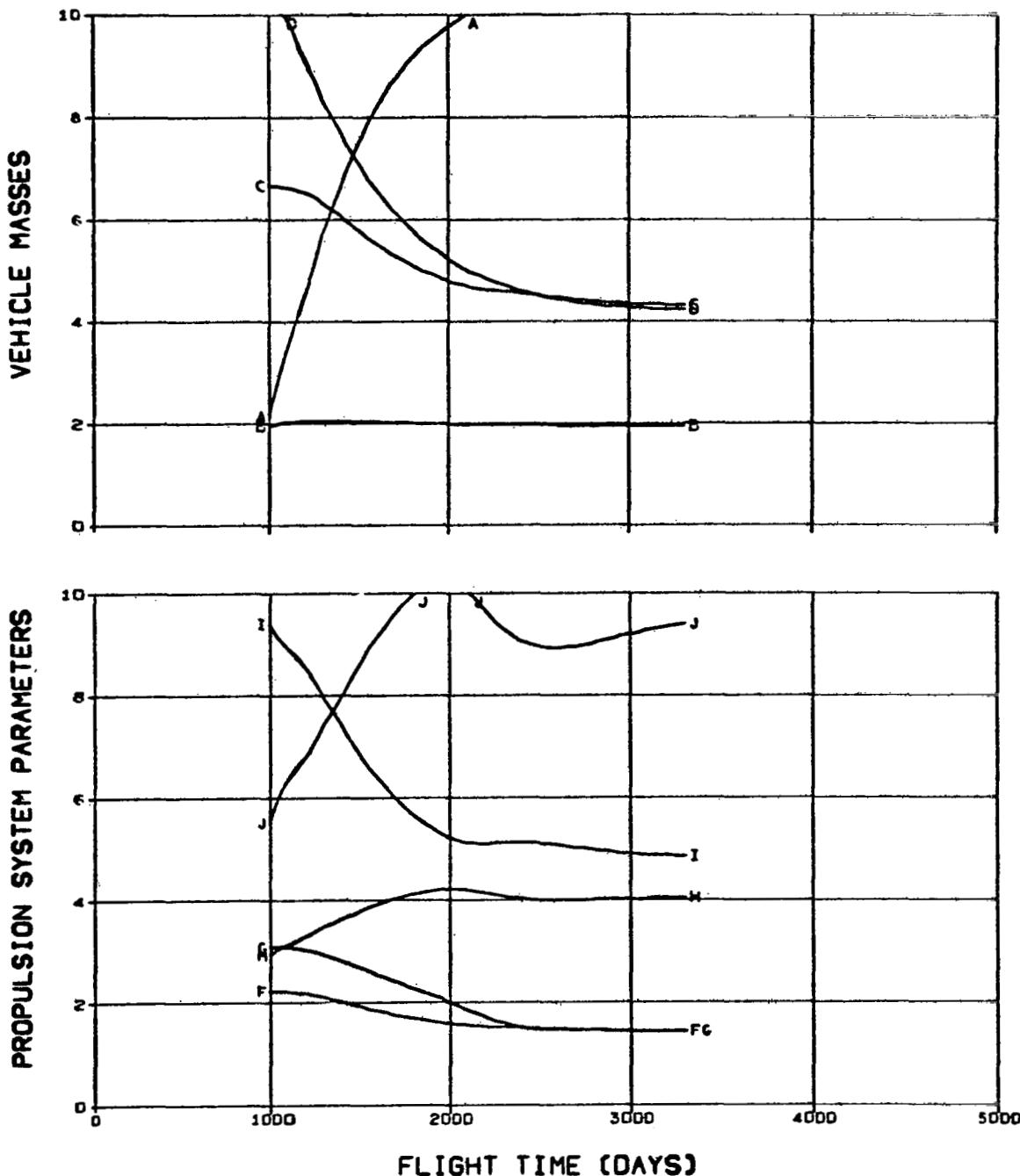


FIG. 6.2.1 SATURN MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

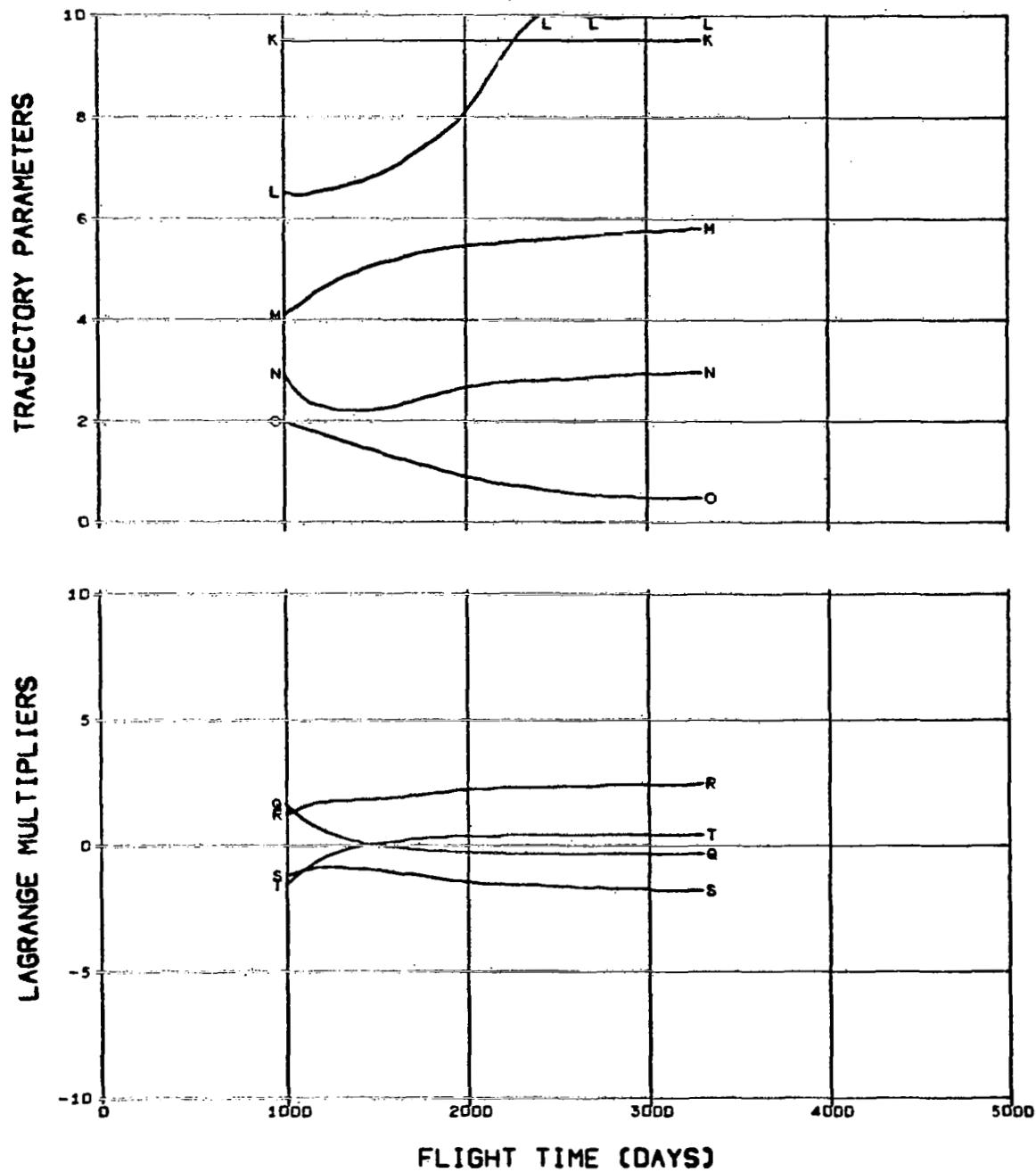


FIG. 6.2.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

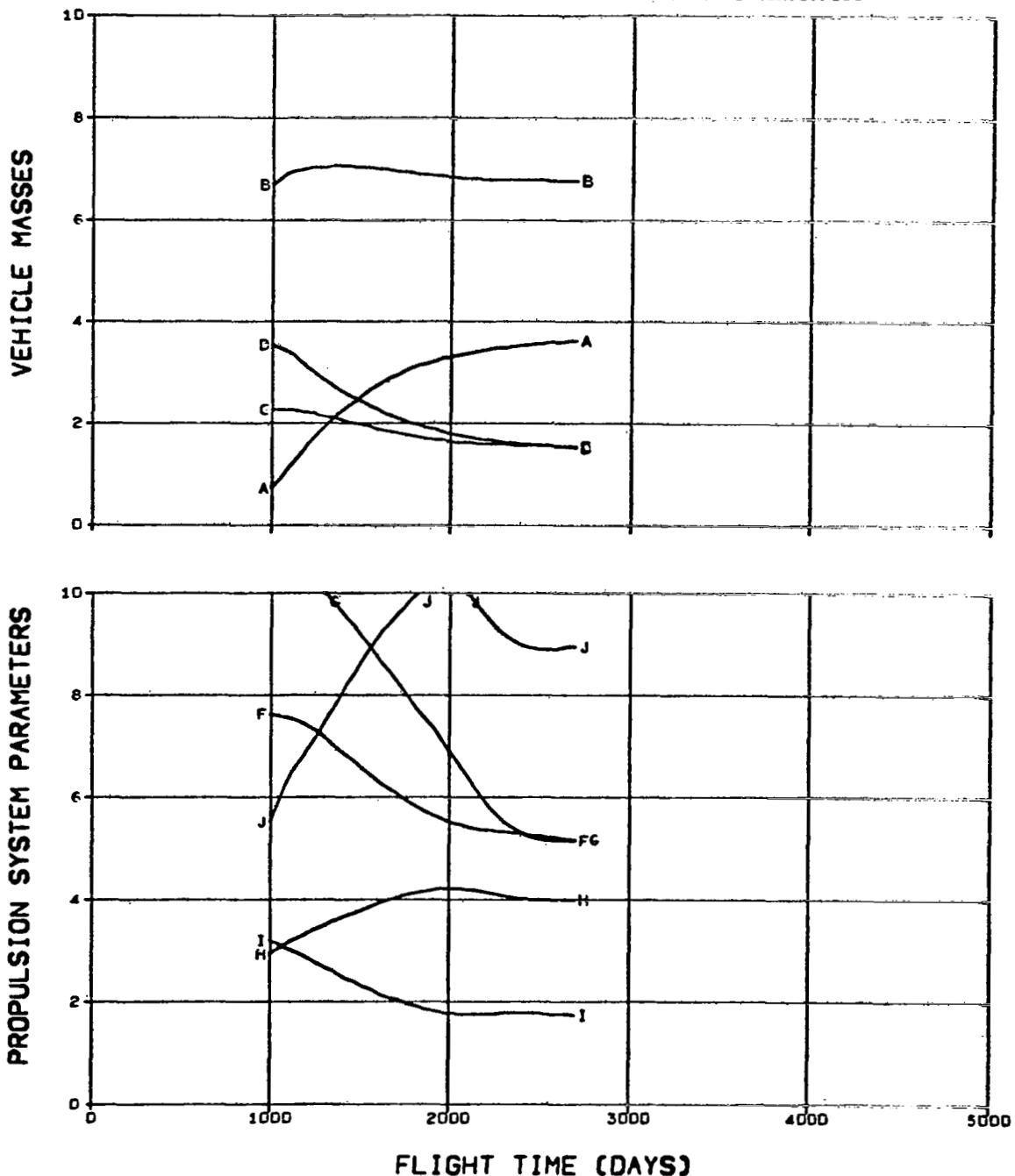


FIG. 6.2.2 SATURN MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

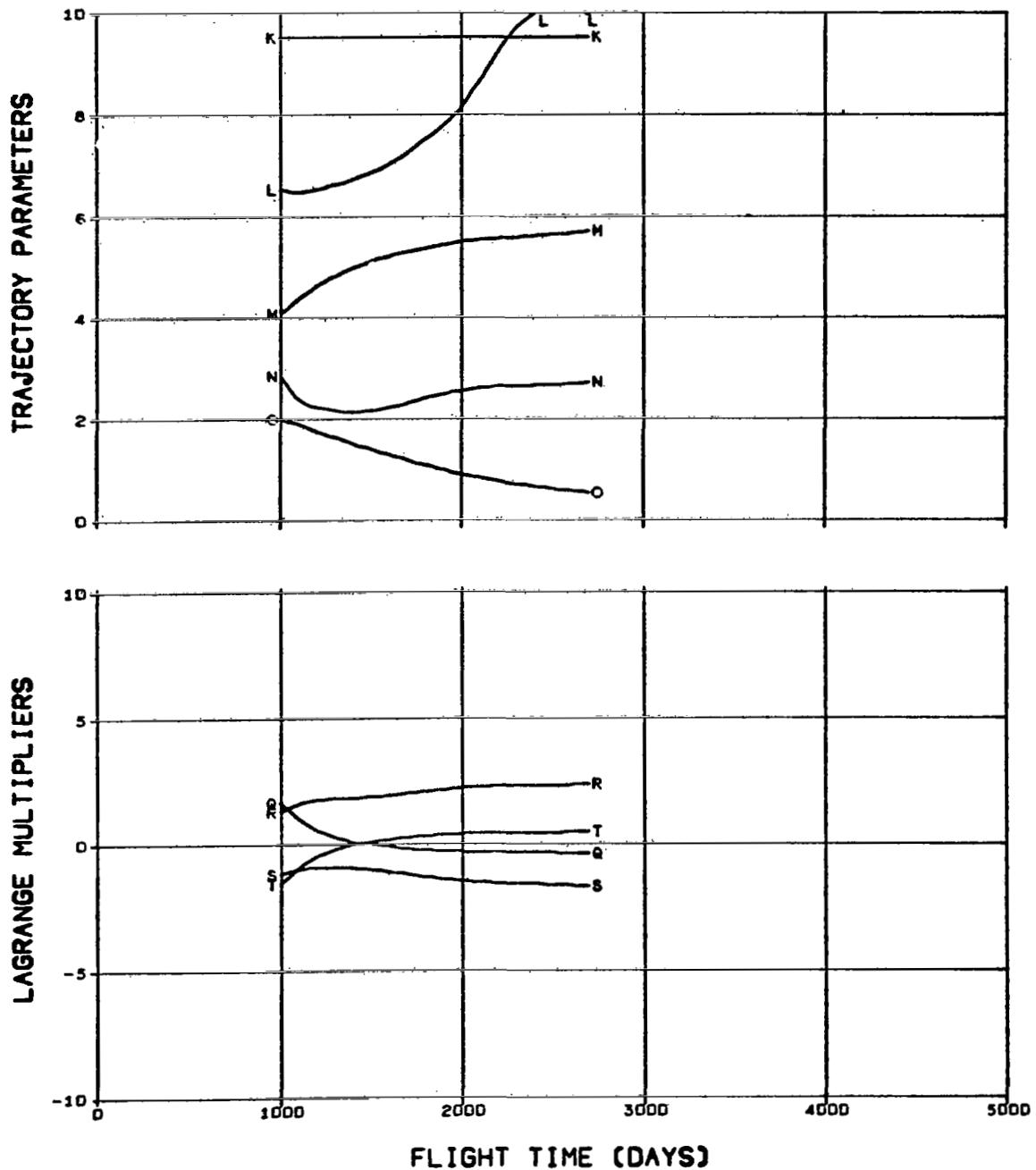


FIG. 6.2.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/30000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/100

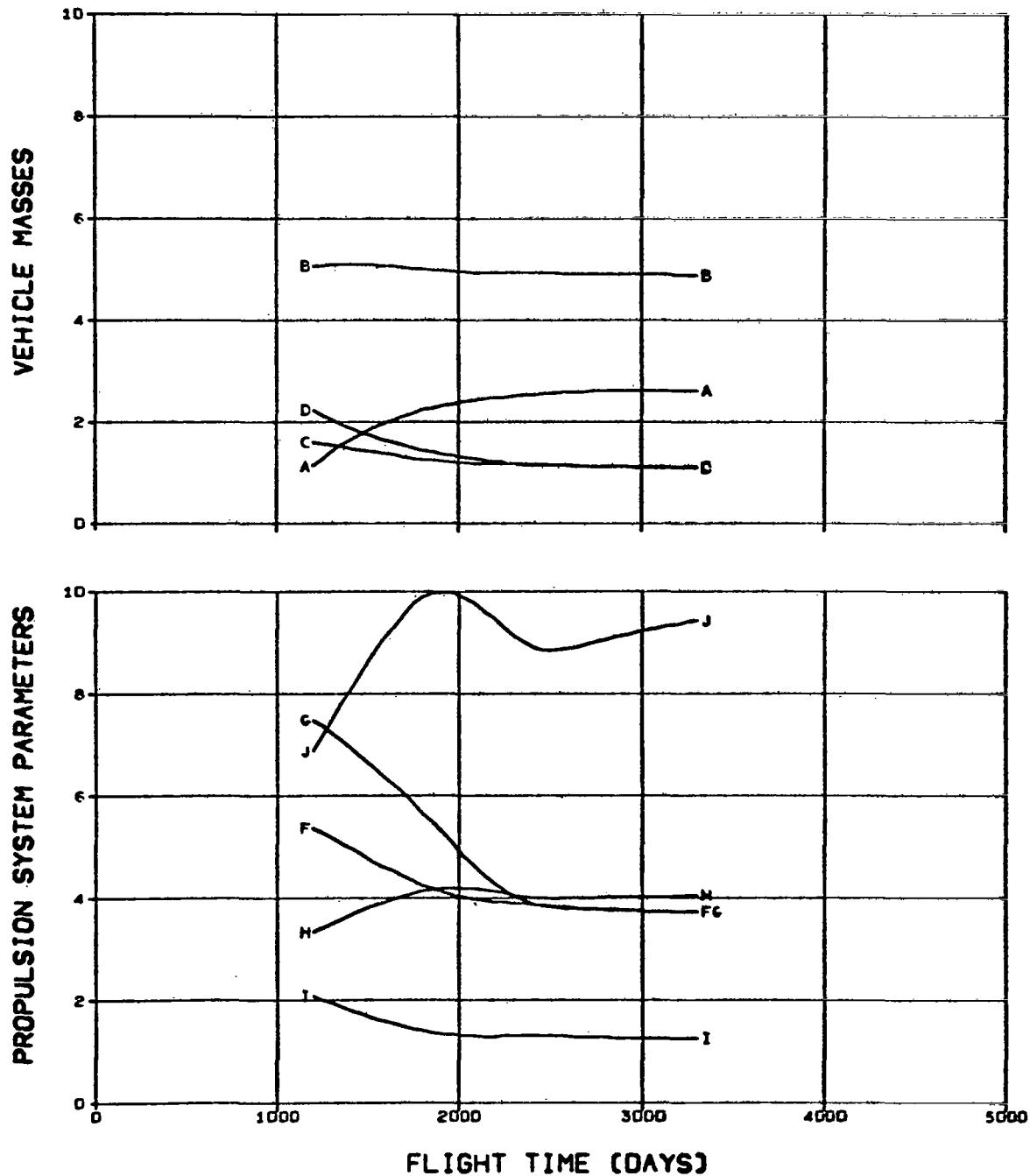


FIG. 6.2.3 SATURN MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

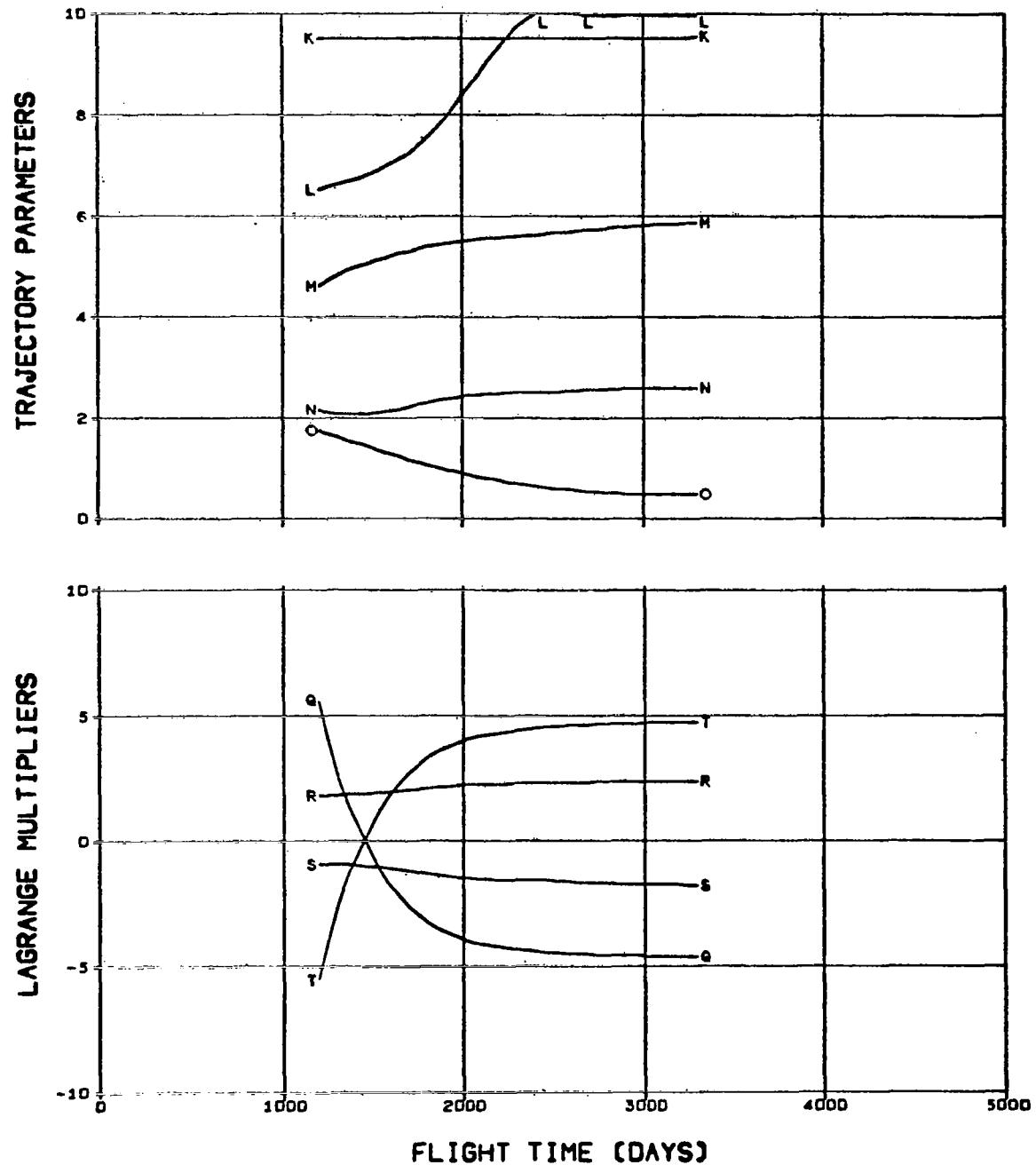


FIG. 6.2.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/100

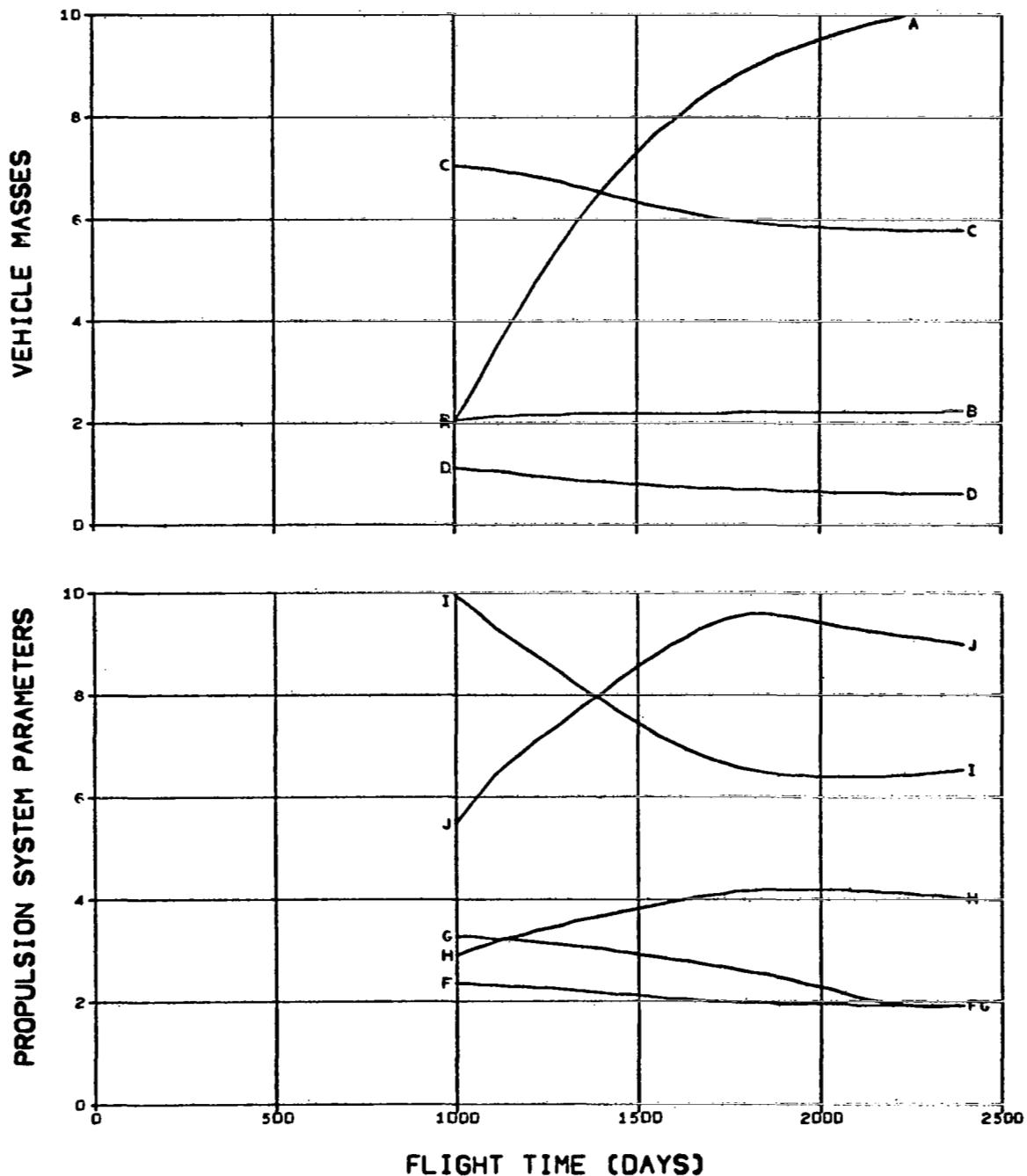


FIG. 6.2.4 SATURN MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

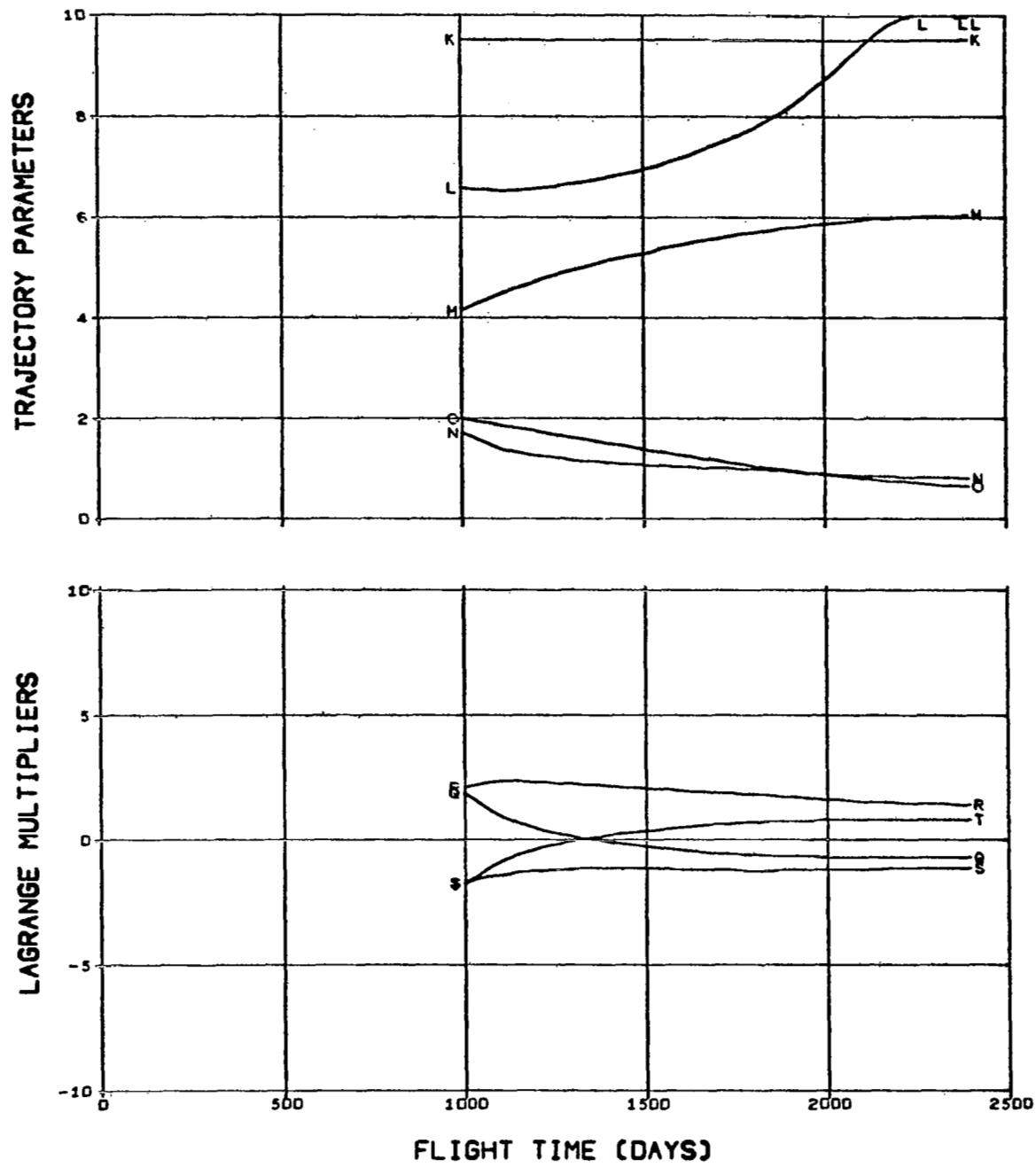


FIG. 6.2.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPELUTION TIME (DAYS)/100

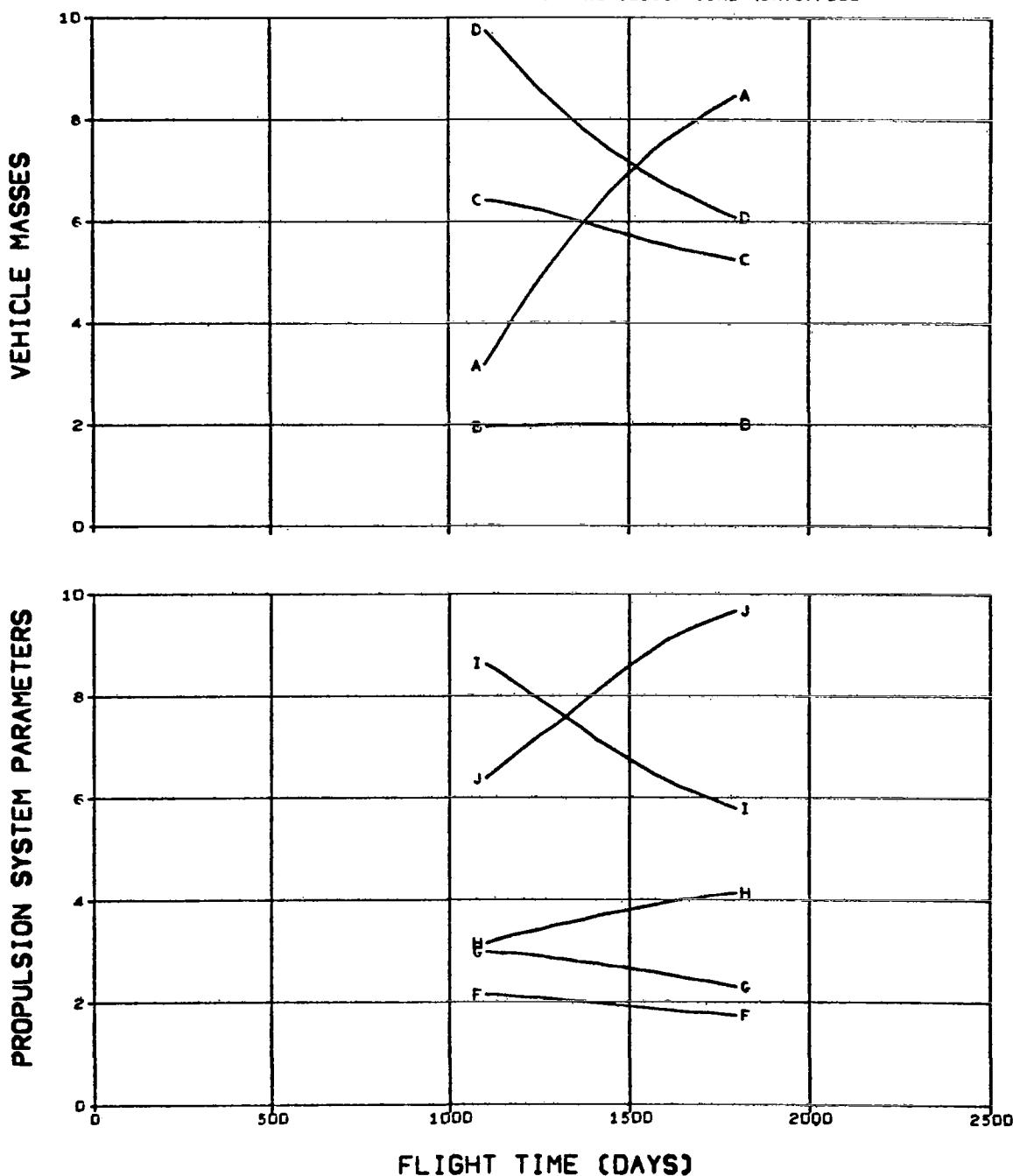


FIG. 6.2.5 SATURN MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

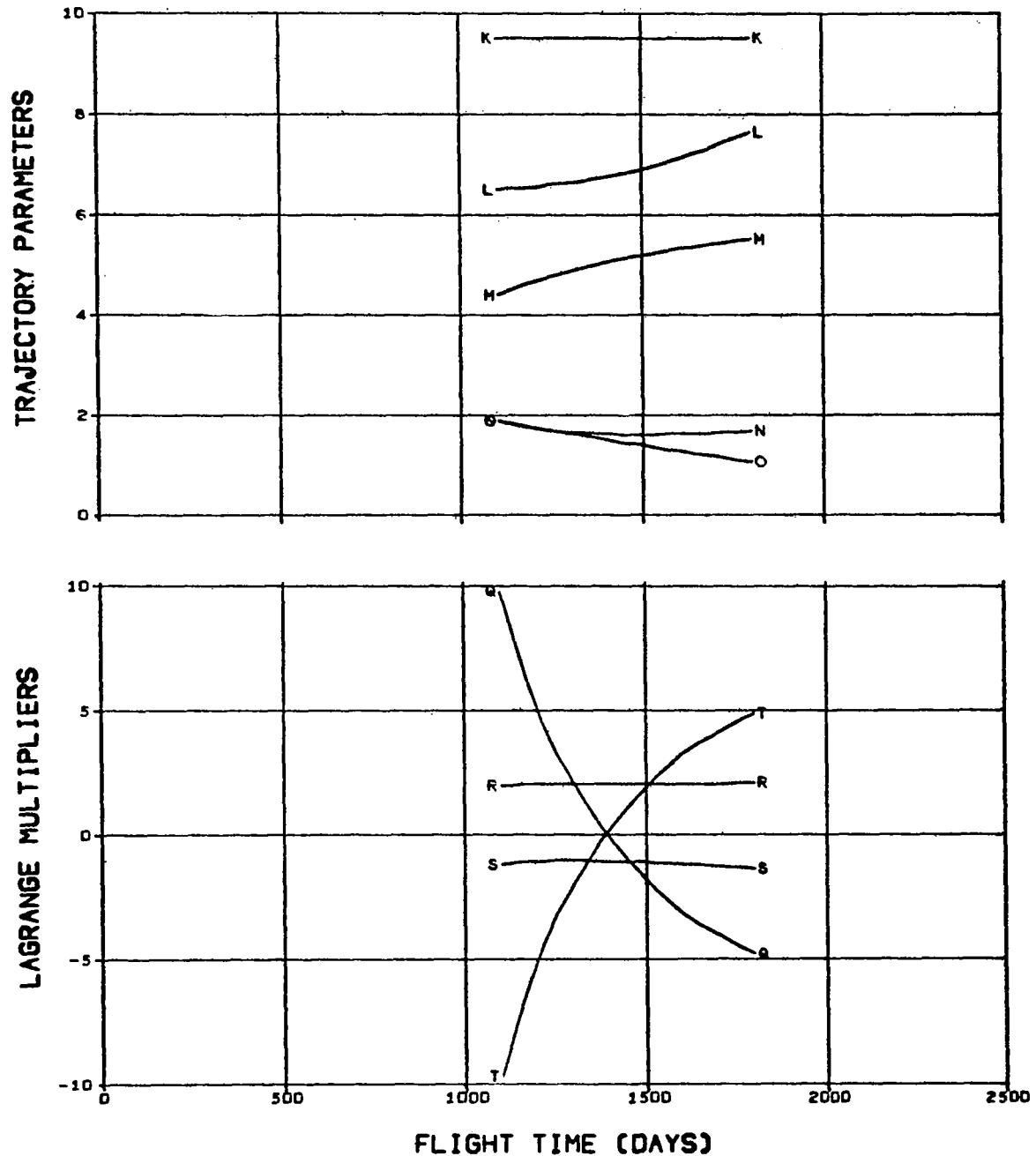
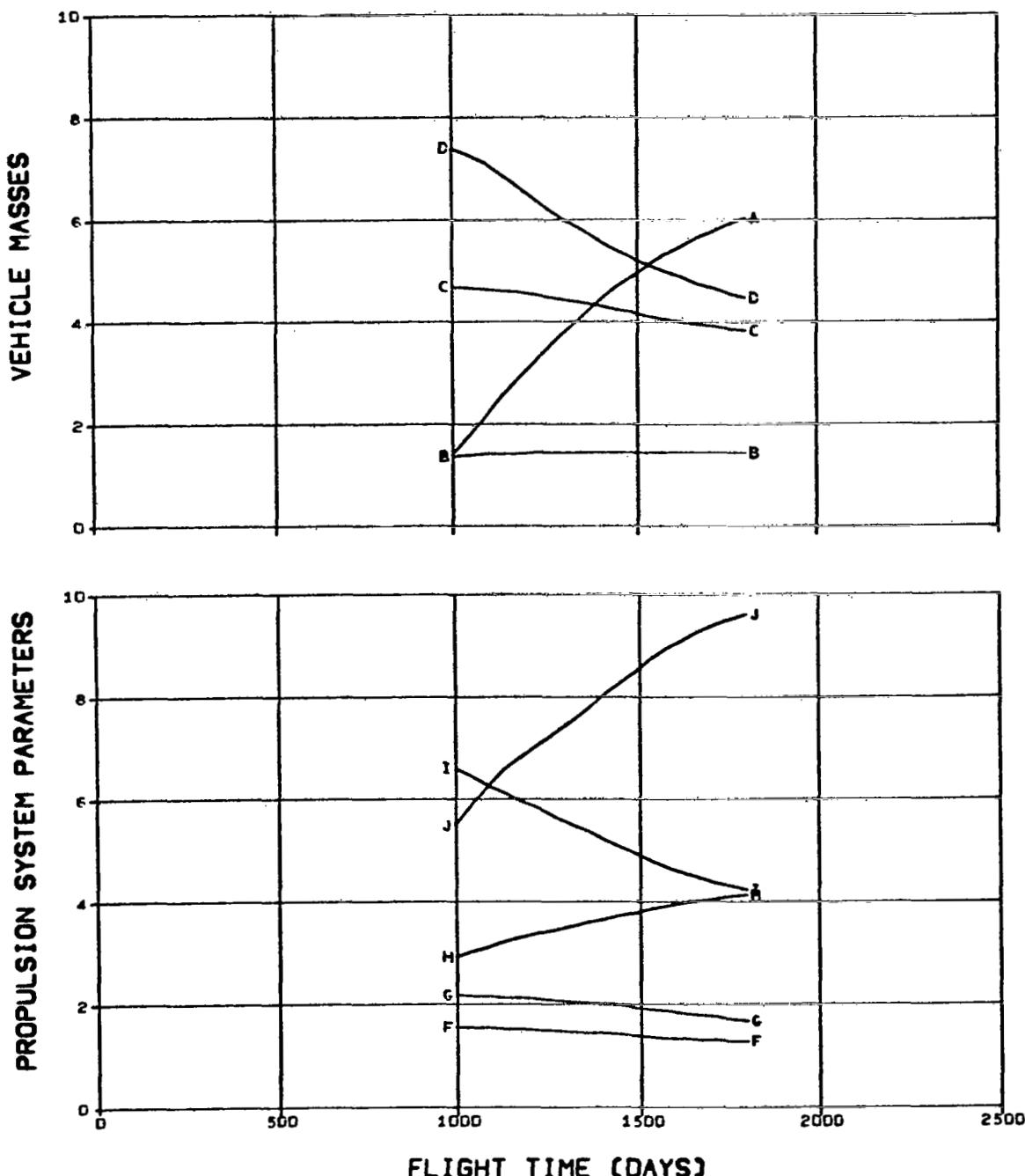


FIG. 6.2.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
		J	PROPULSION TIME (DAYS)/100



**FIG. 6.2.6 SATURN MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE**

K MAXIMUM SOLAR DISTANCE (AU) Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

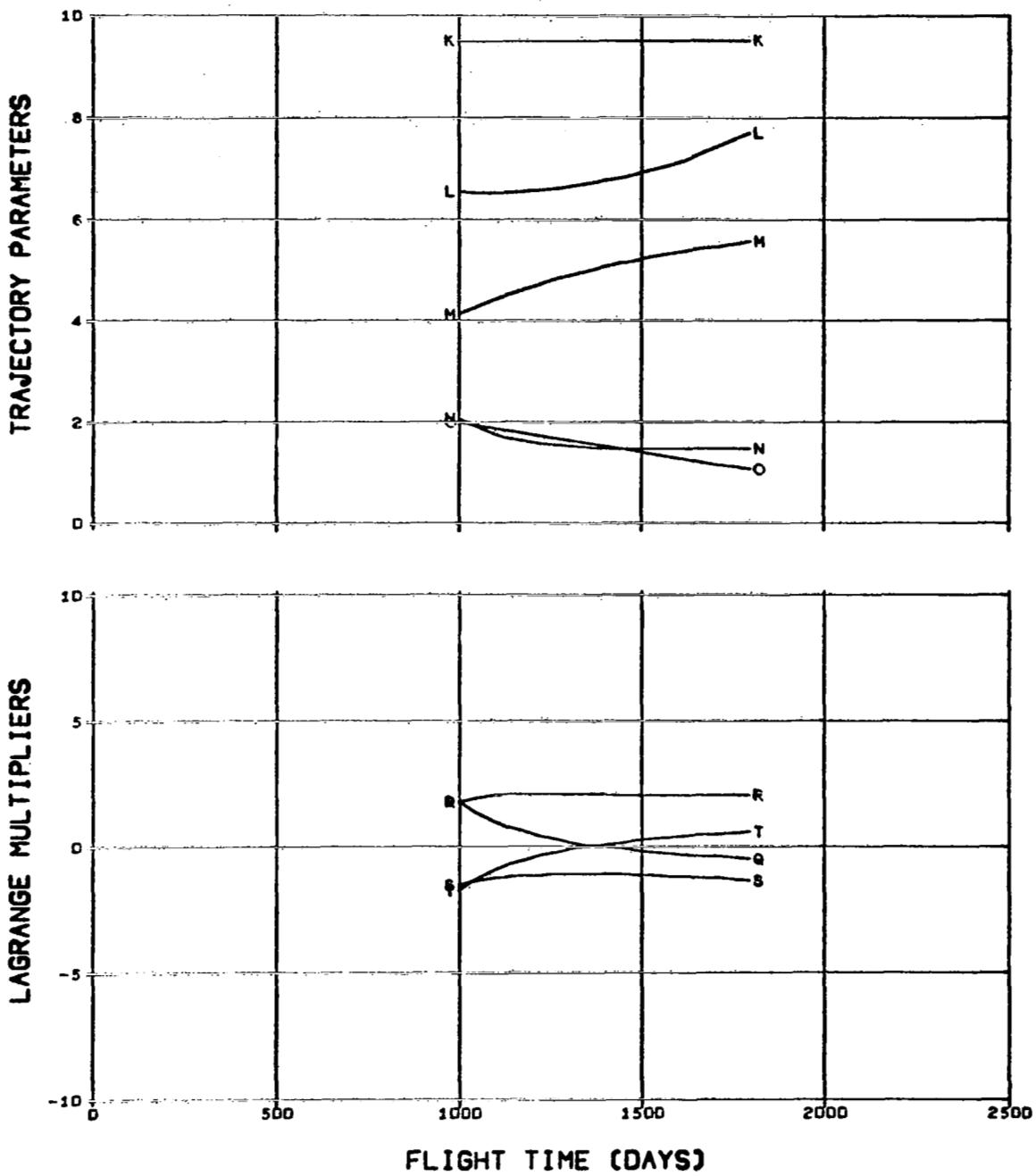
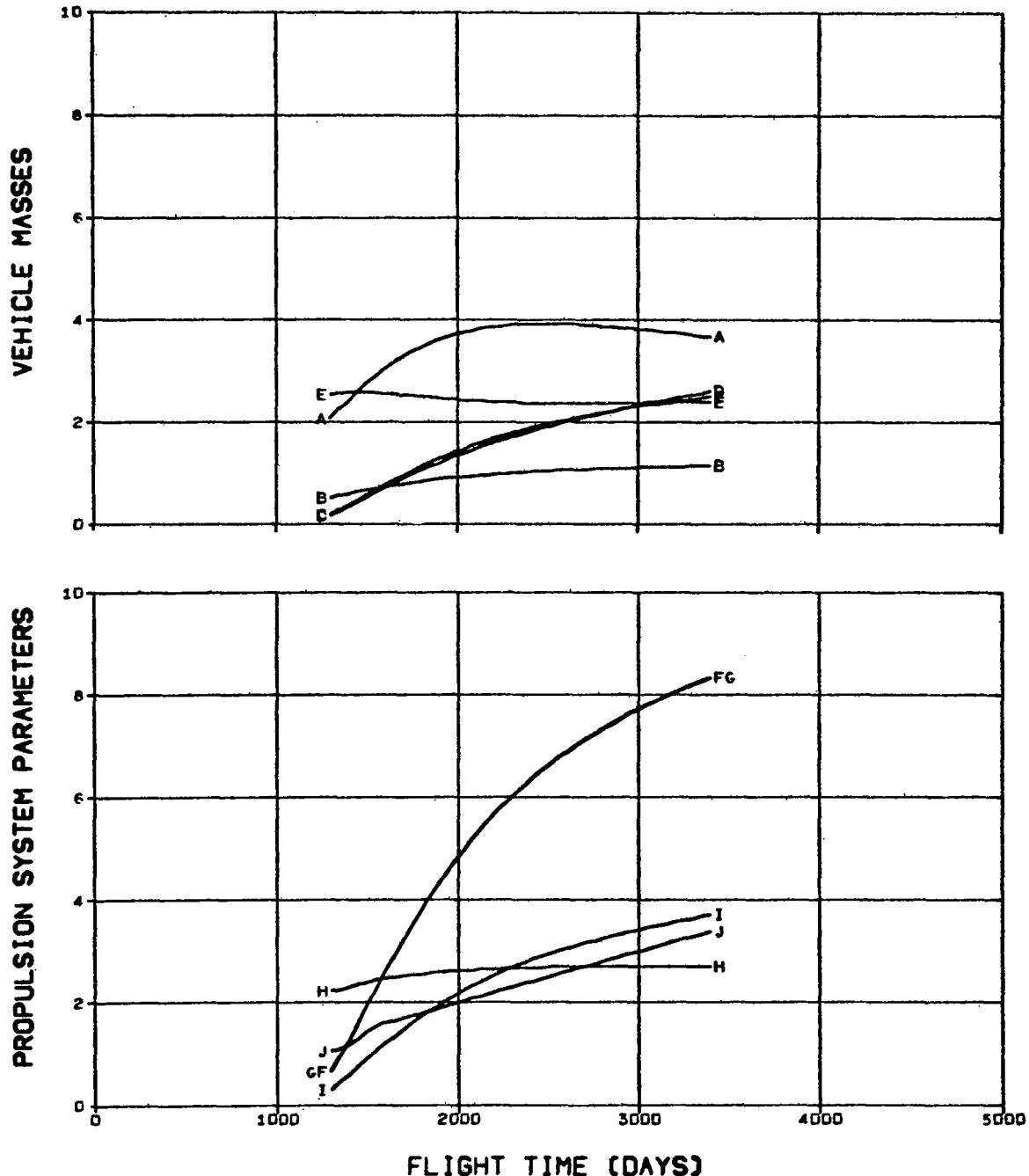


FIG. 6.2.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 6.3.1 SATURN MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

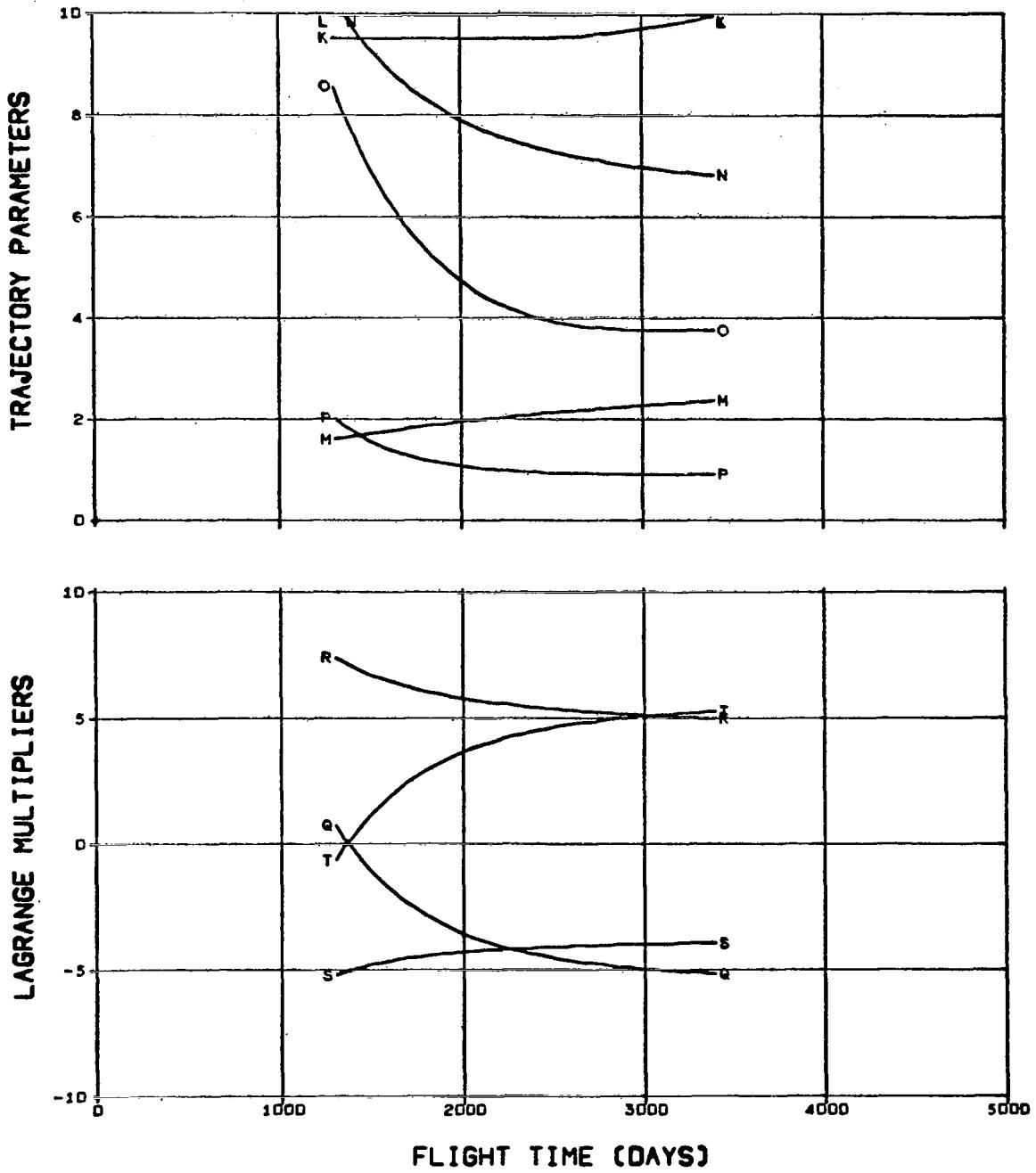
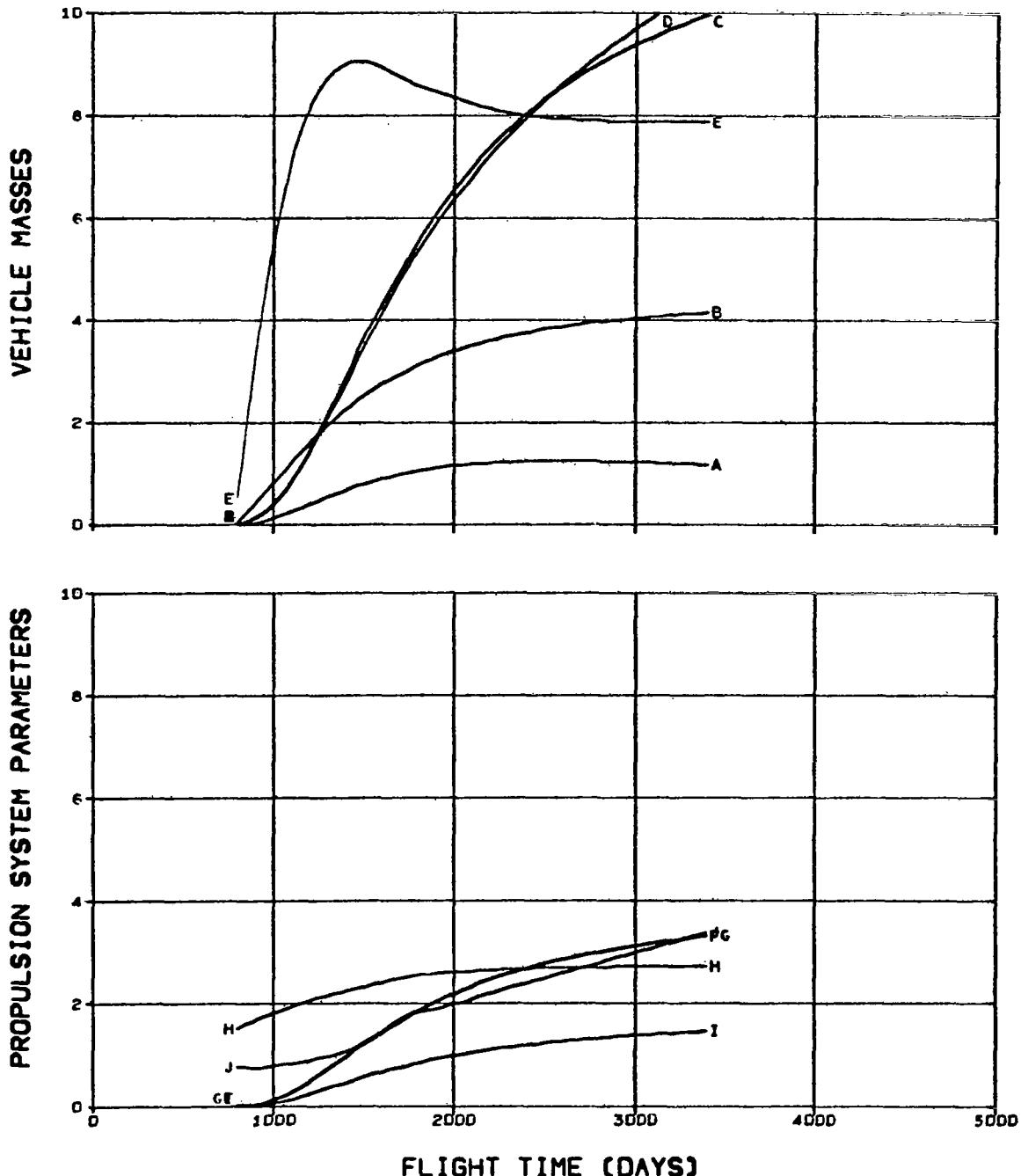


FIG. 6.3.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 6.3.2 SATURN MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	T-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/10000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

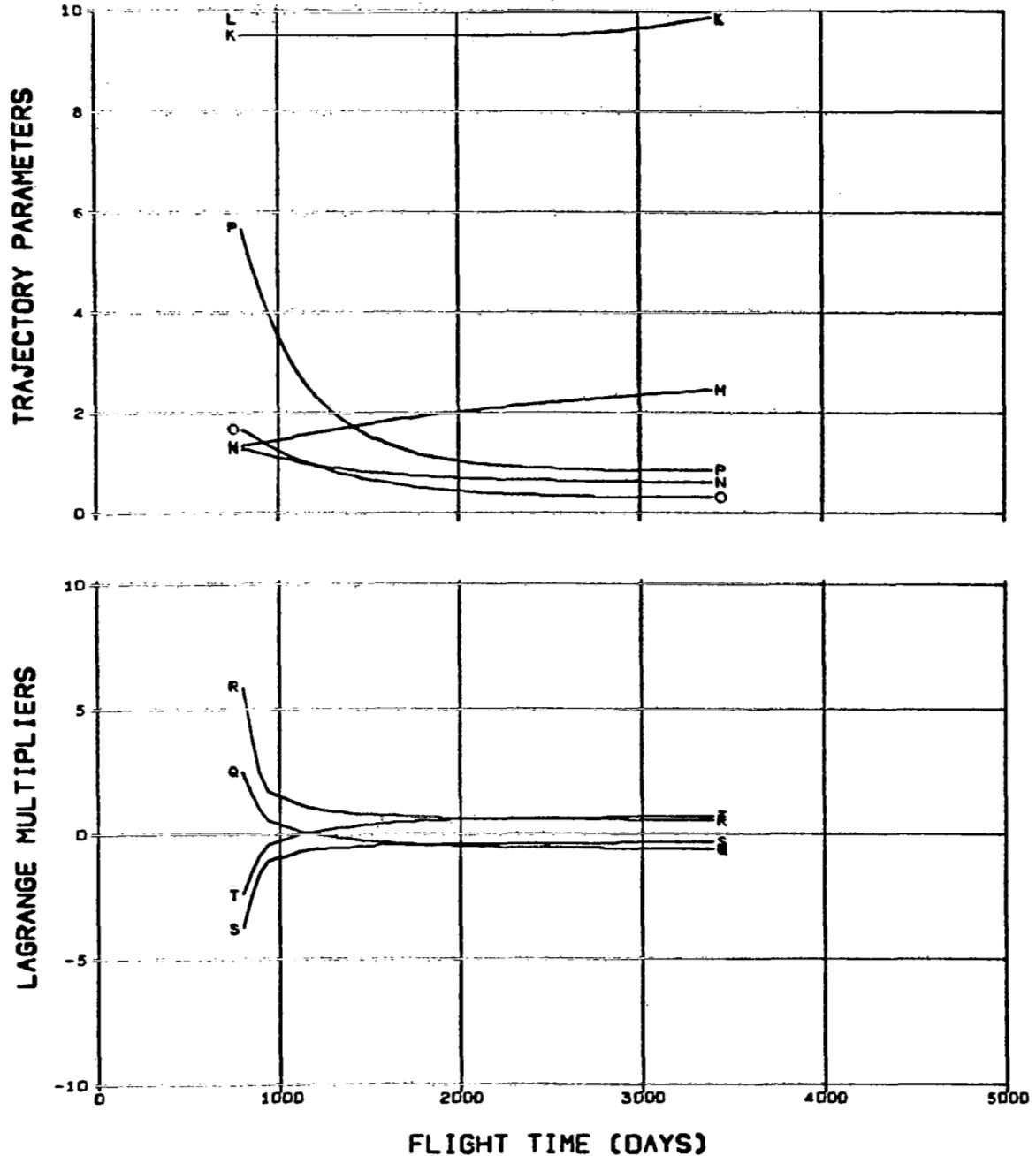
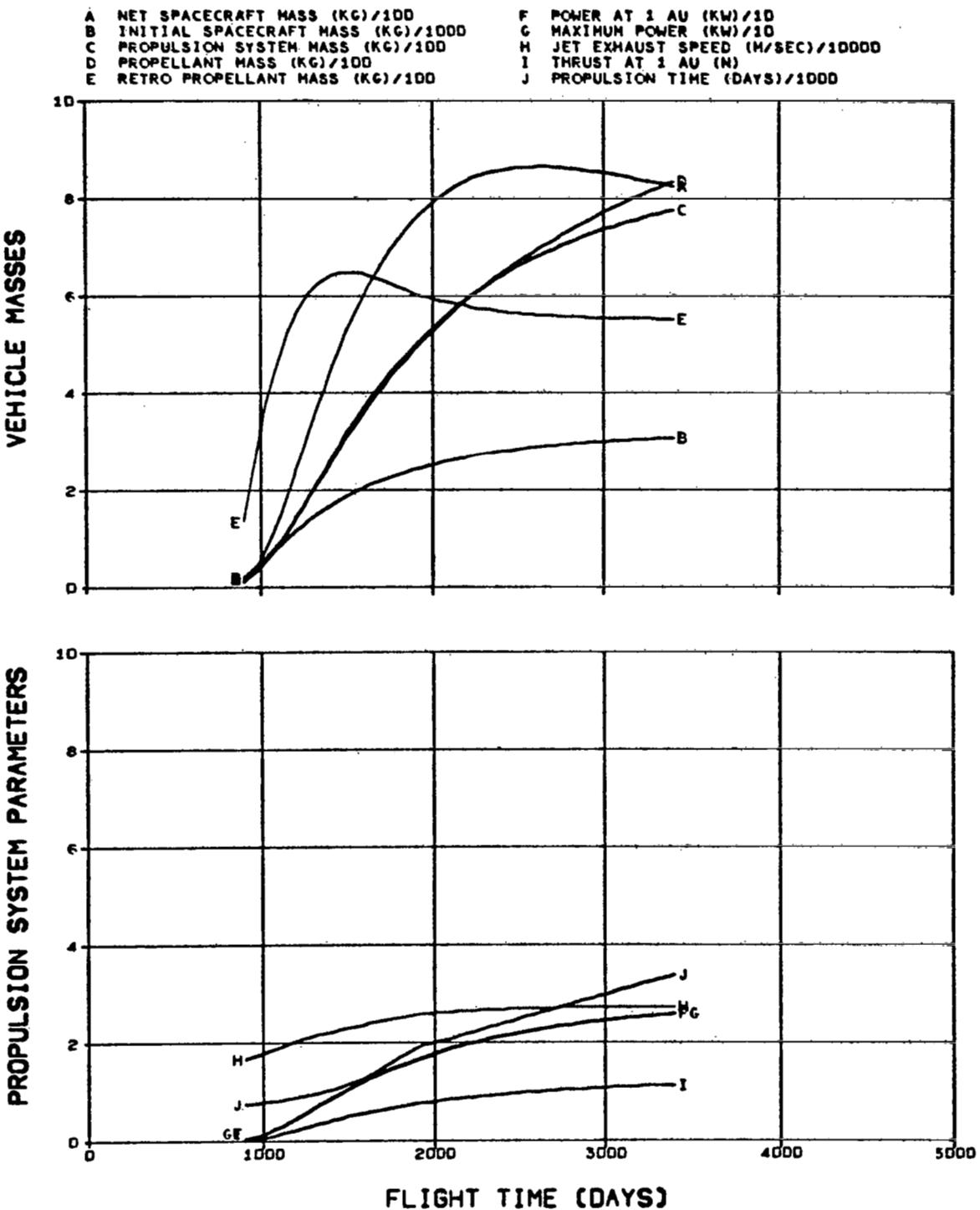


FIG. 6.3.2 (CONCLUDED)



**FIG. 6.3.3 SATURN MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER/10
 N LAUNCH EXCESS SPEED (M/SEC)/10000 S X-COMPONENT OF PRIMER DERIVATIVE/10
 O ARRIVAL EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

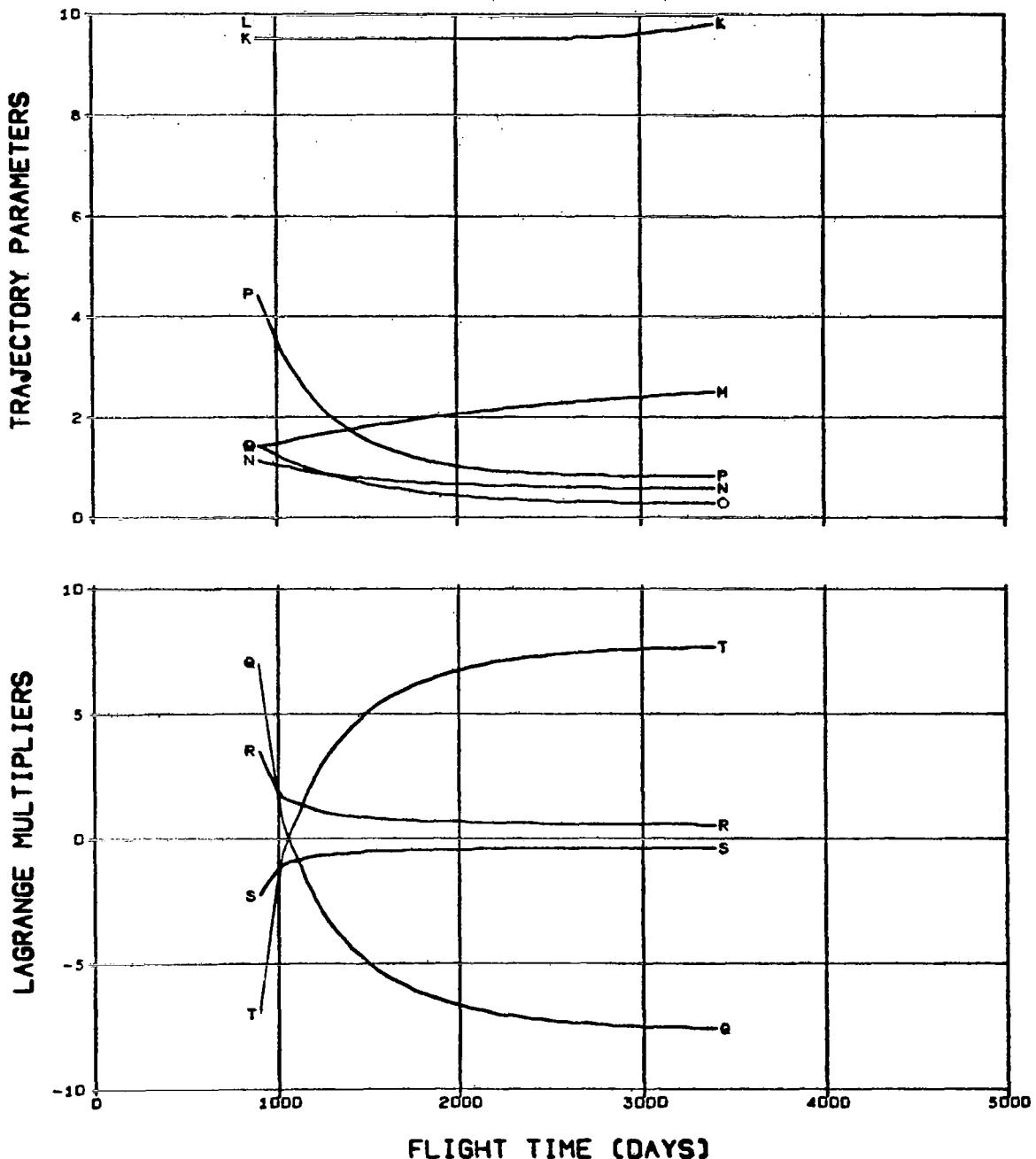


FIG. 6.3.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

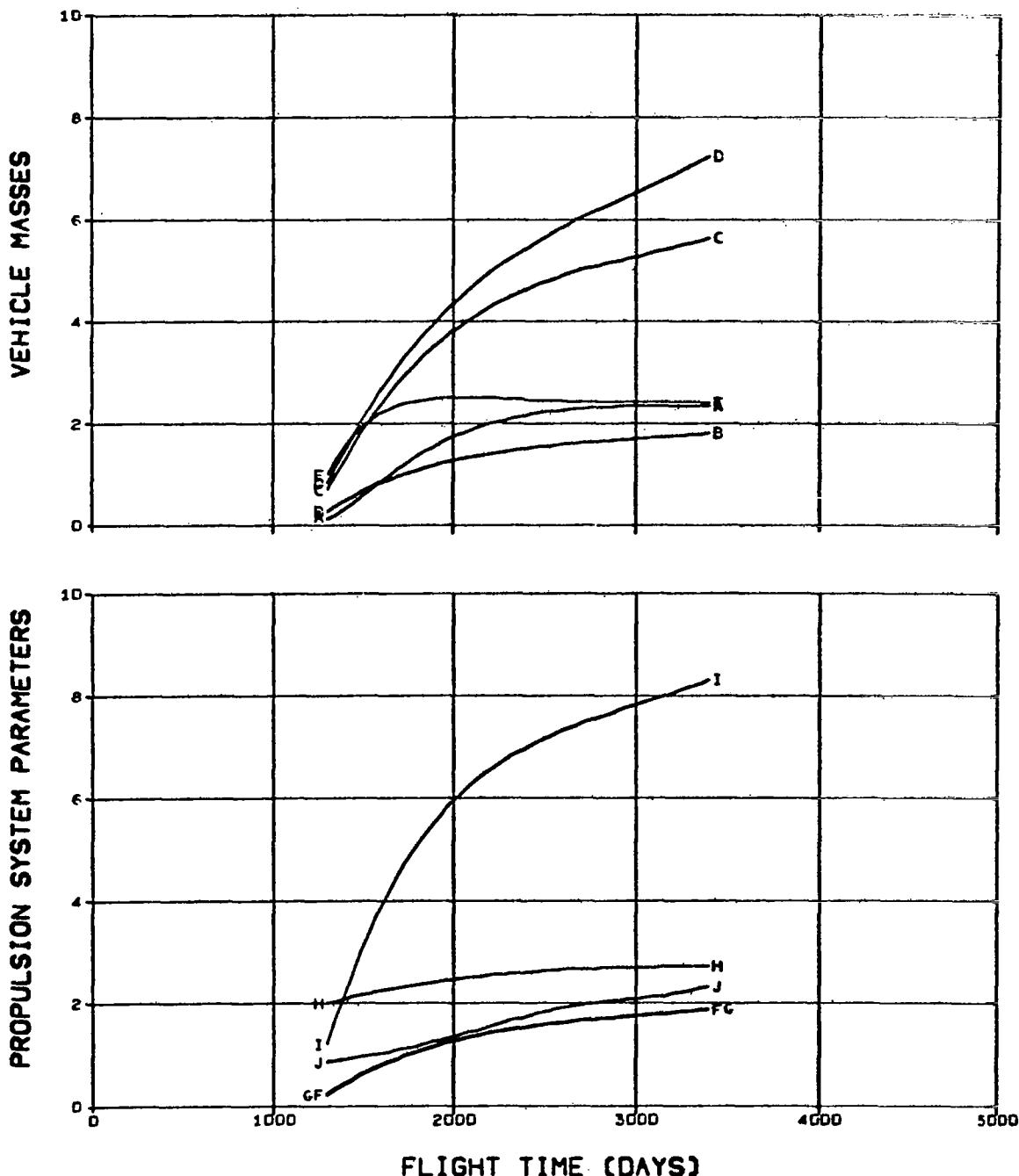


FIG. 6.3.4 SATURN MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

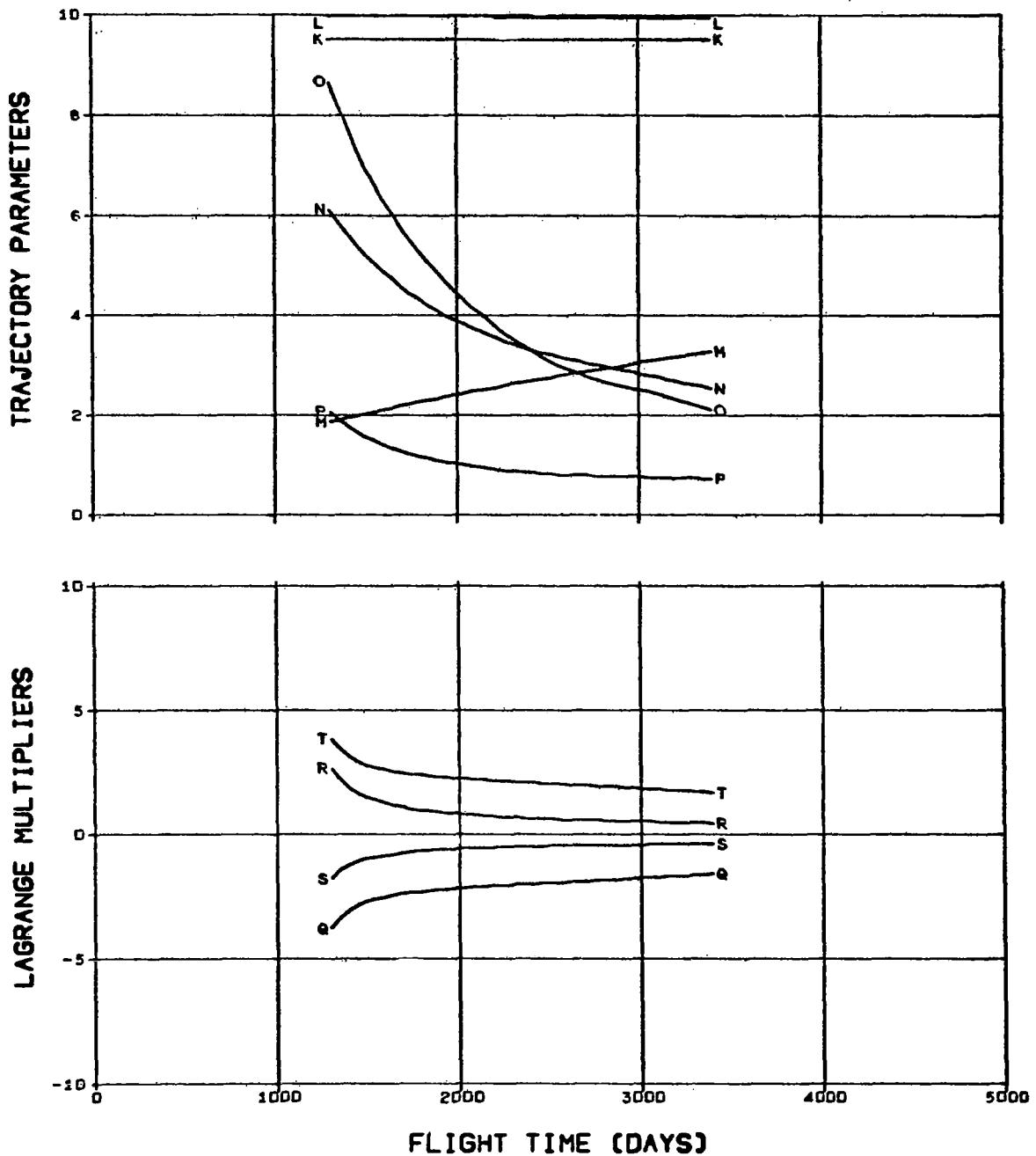


FIG. 6.3.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

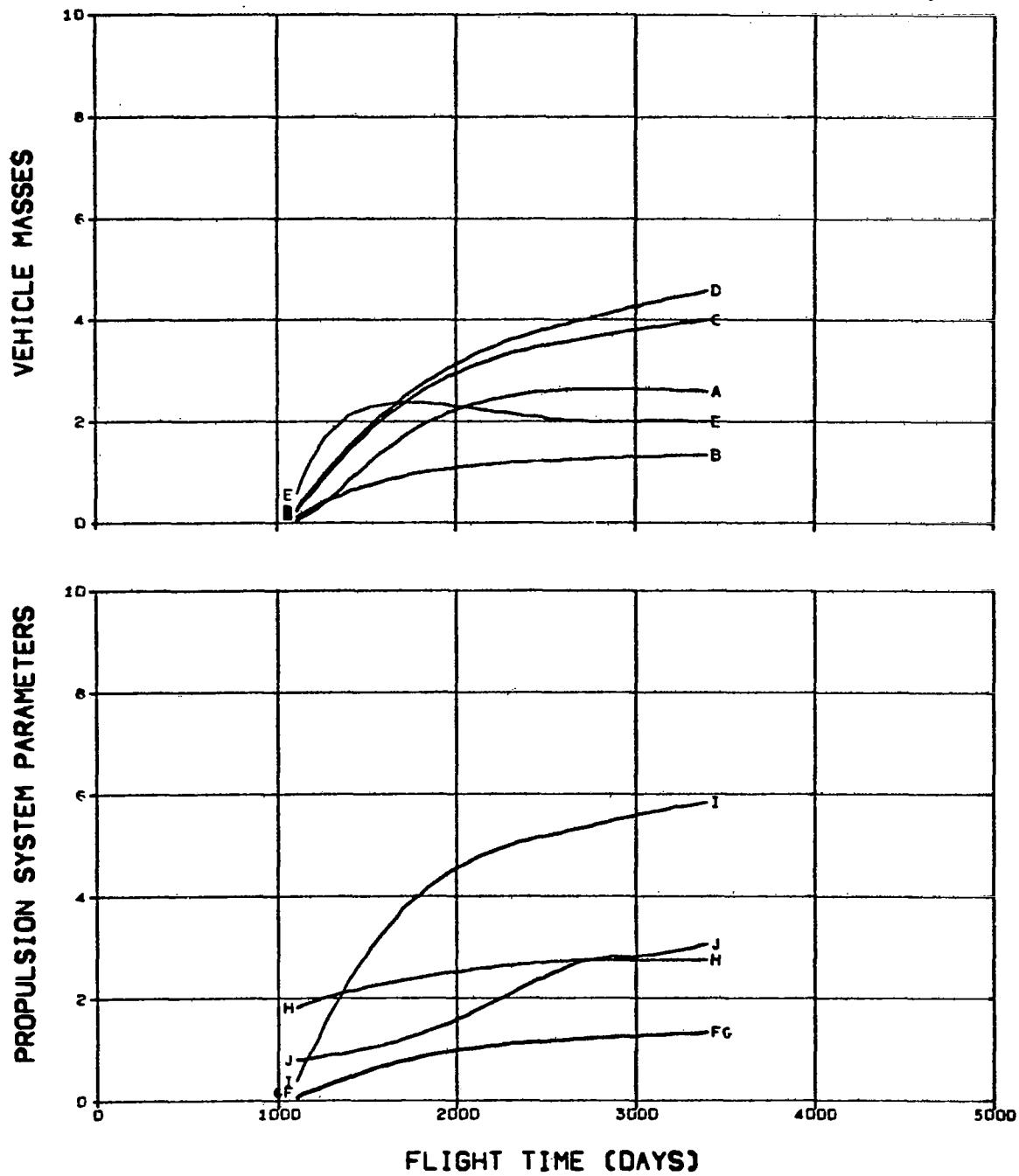


FIG. 6.3.5 SATURN MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU).	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

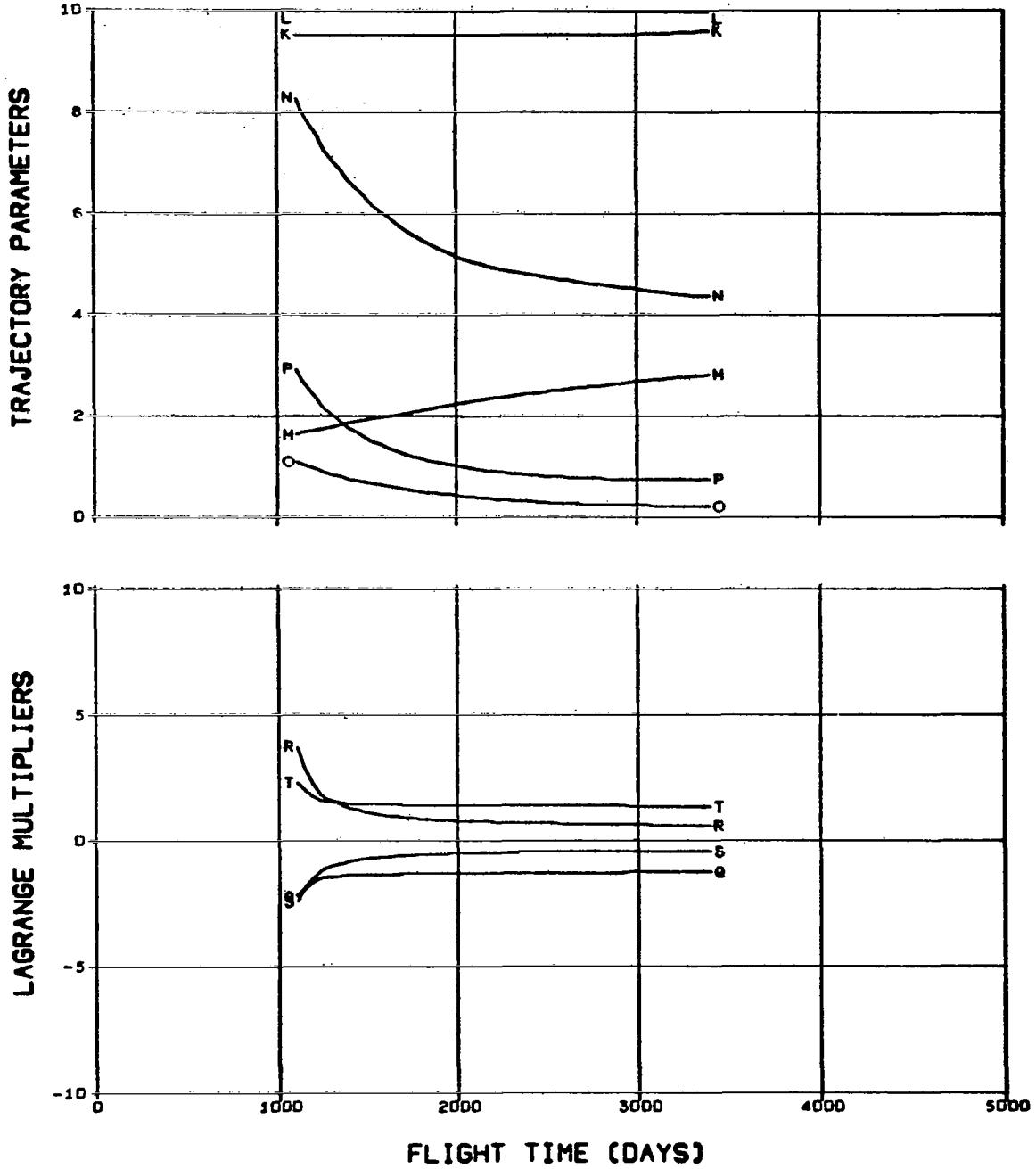


FIG. 6.3.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/100	G	MAXIMUM POWER (KW)
C	PROPELUSION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

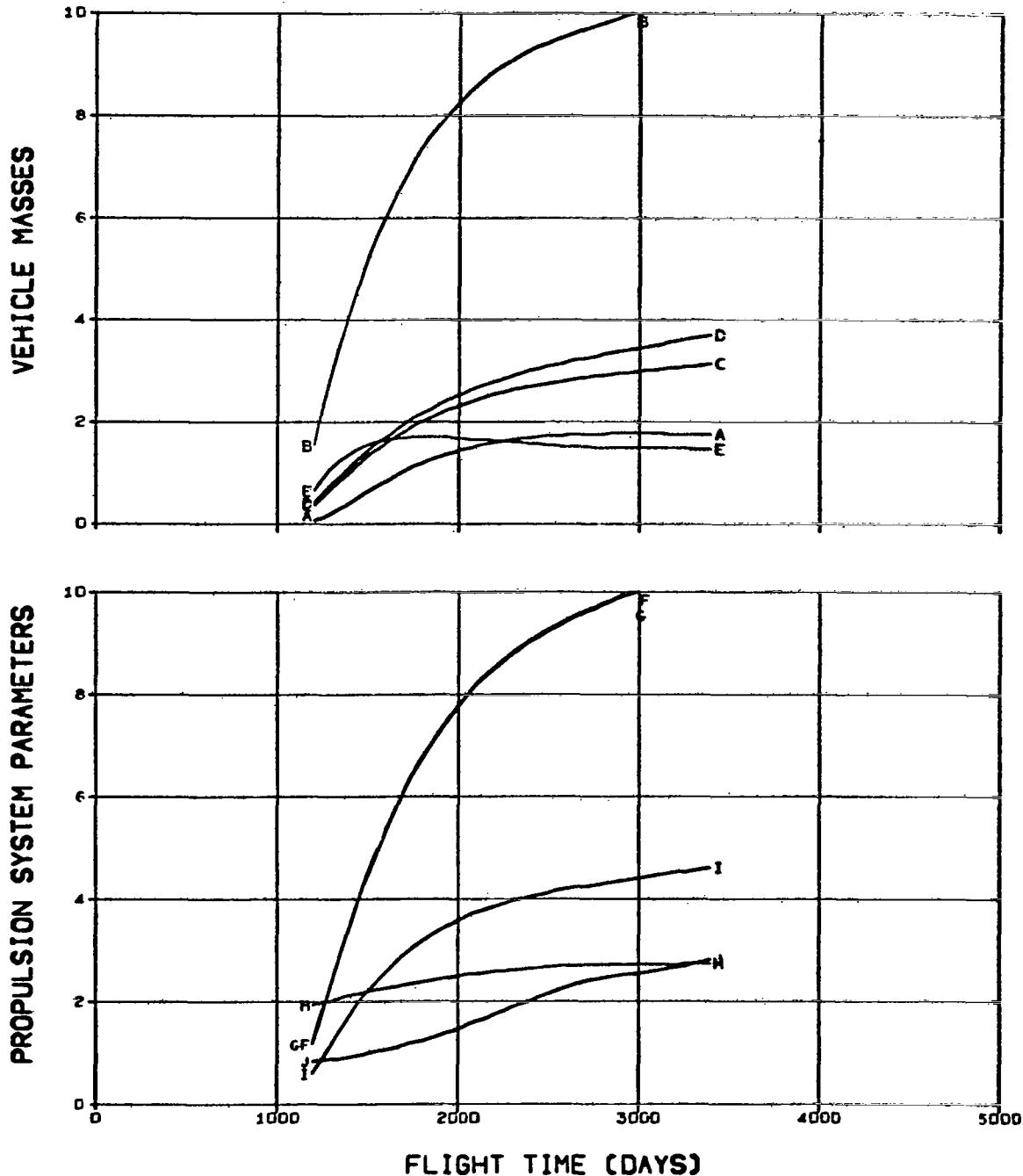


FIG. 6.3.6 SATURN MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELUSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE/10
 T Y-COMPONENT OF PRIMER DERIVATIVE

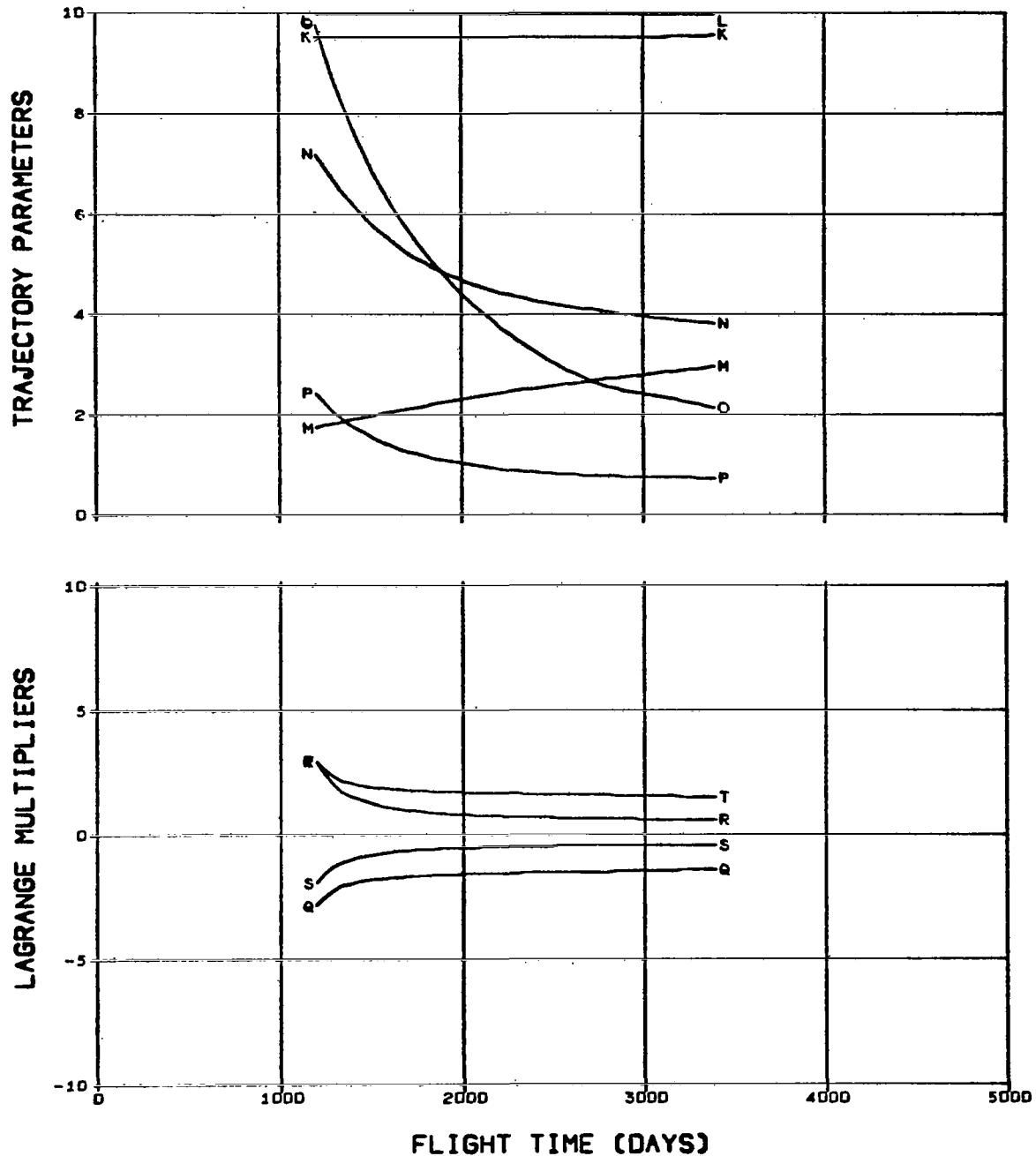


FIG. 6.3.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

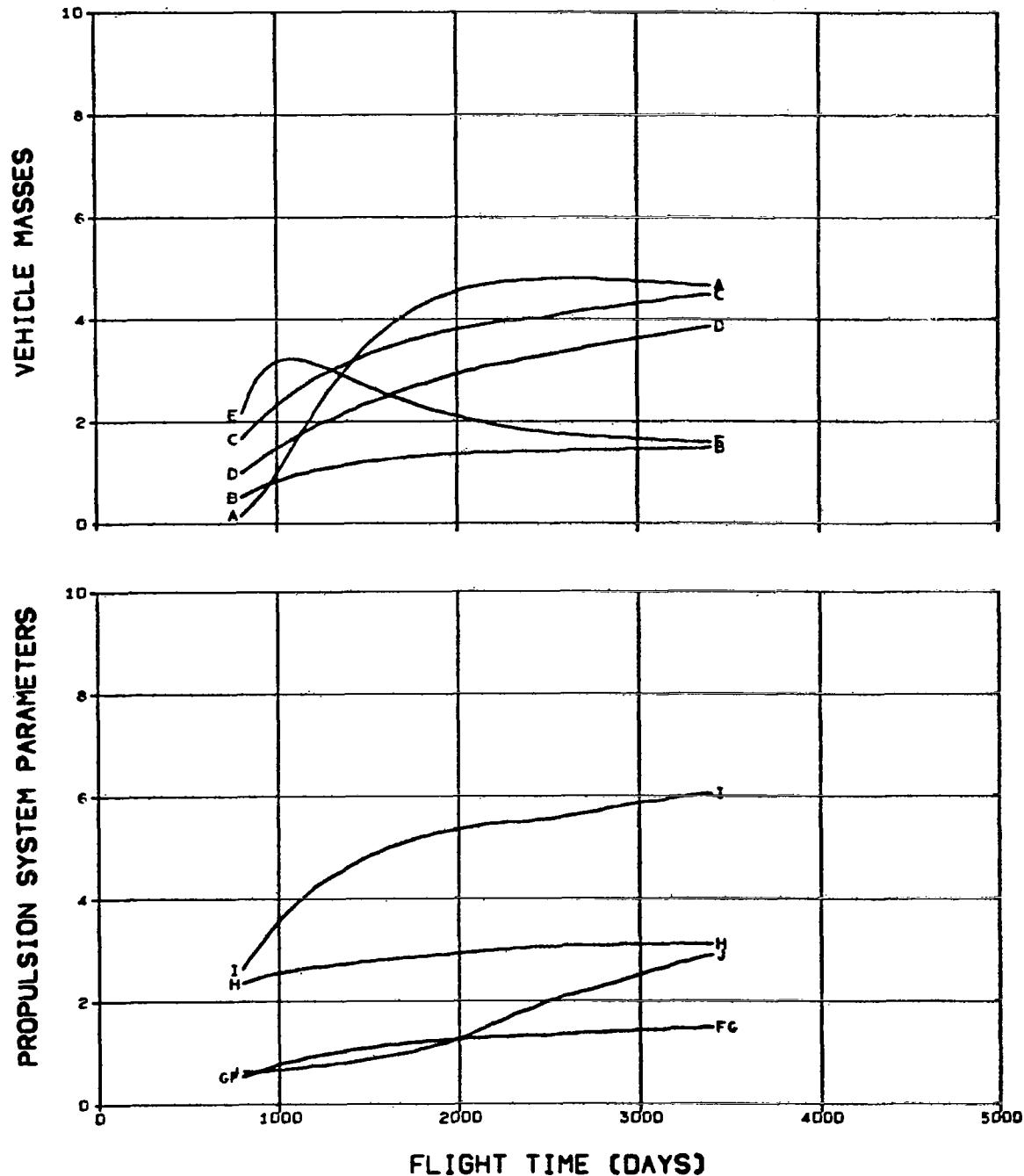


FIG. 6.4.1 SATURN MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

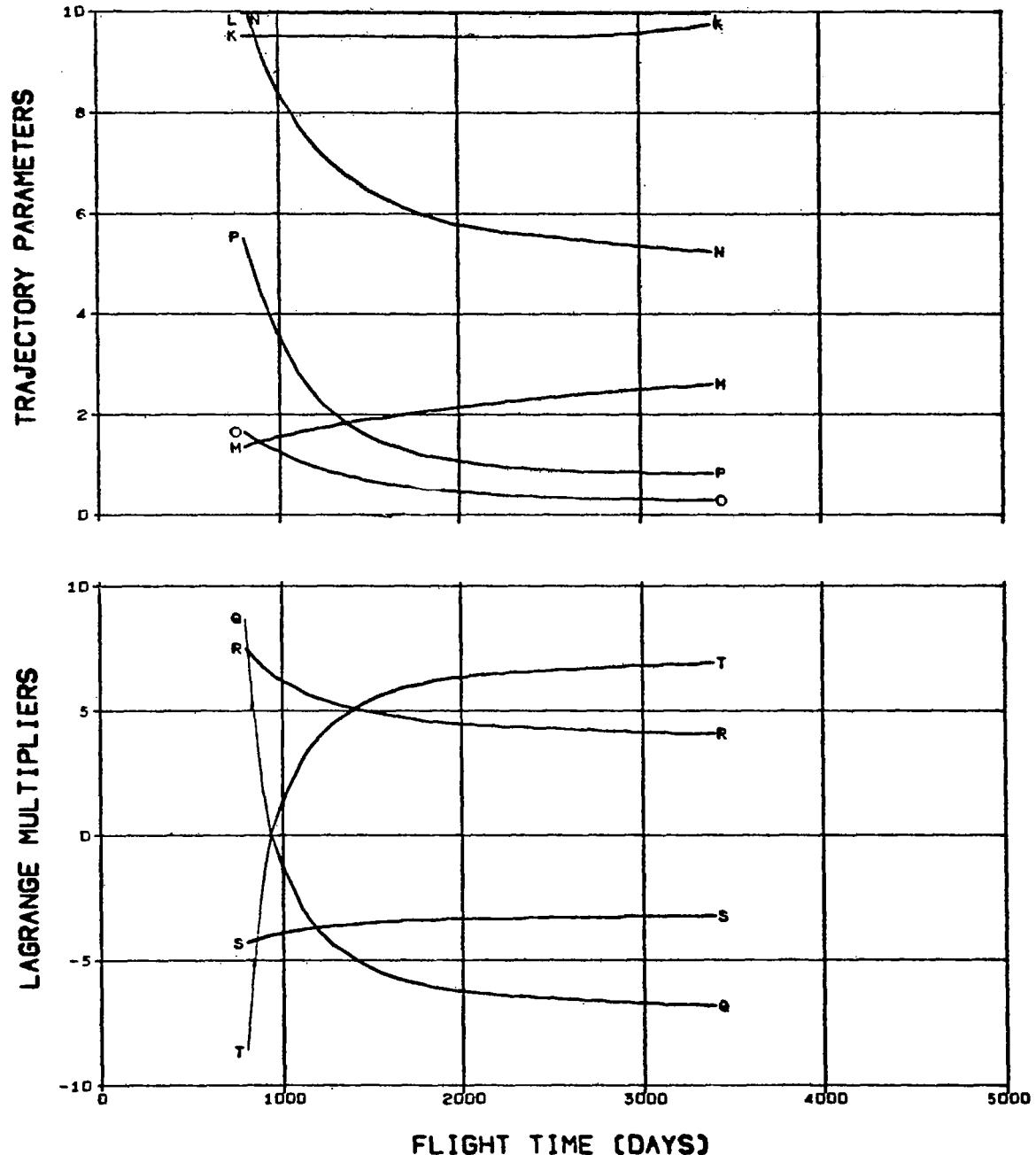
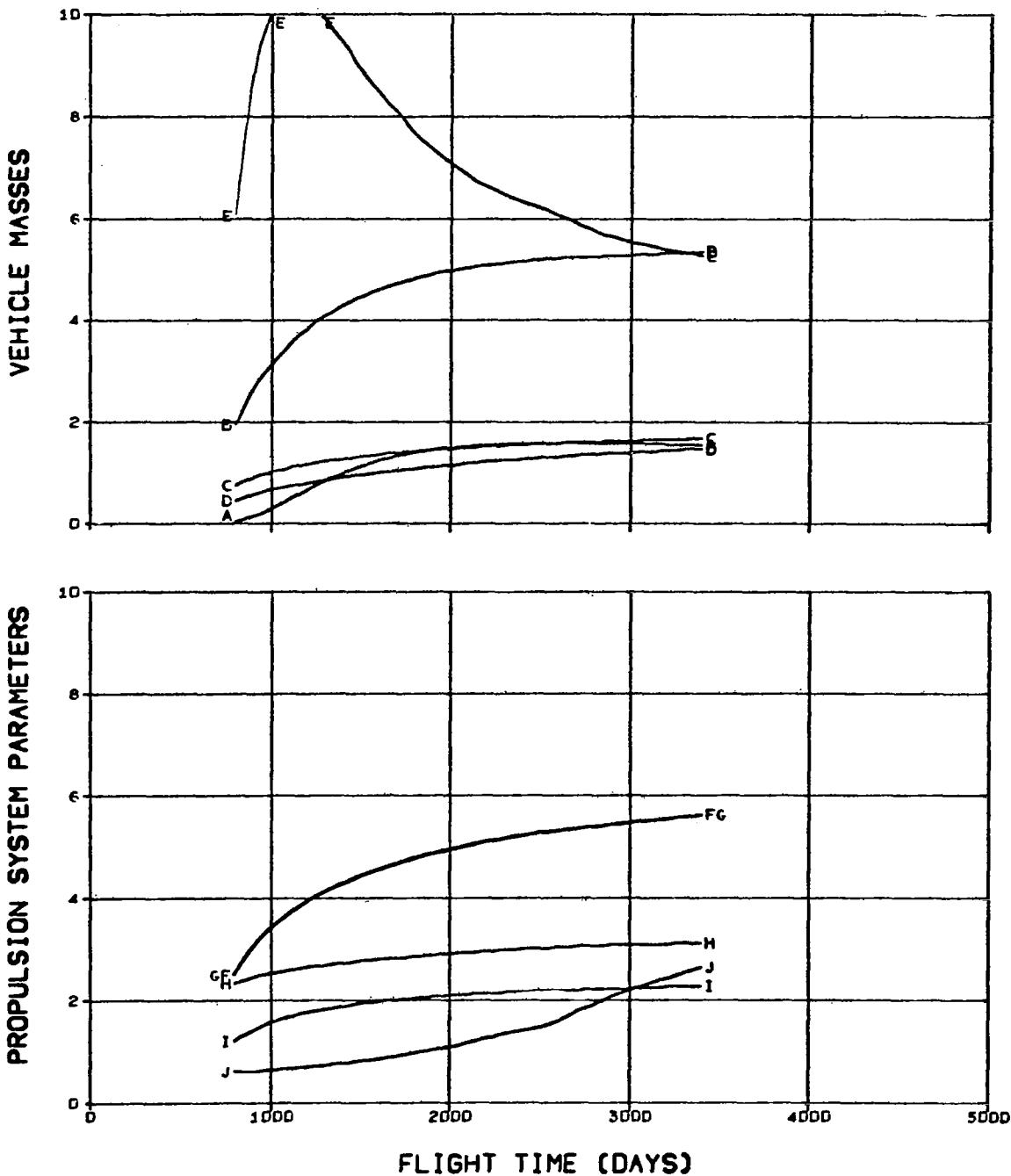


FIG. 6.4.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 6.4.2 SATURN MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

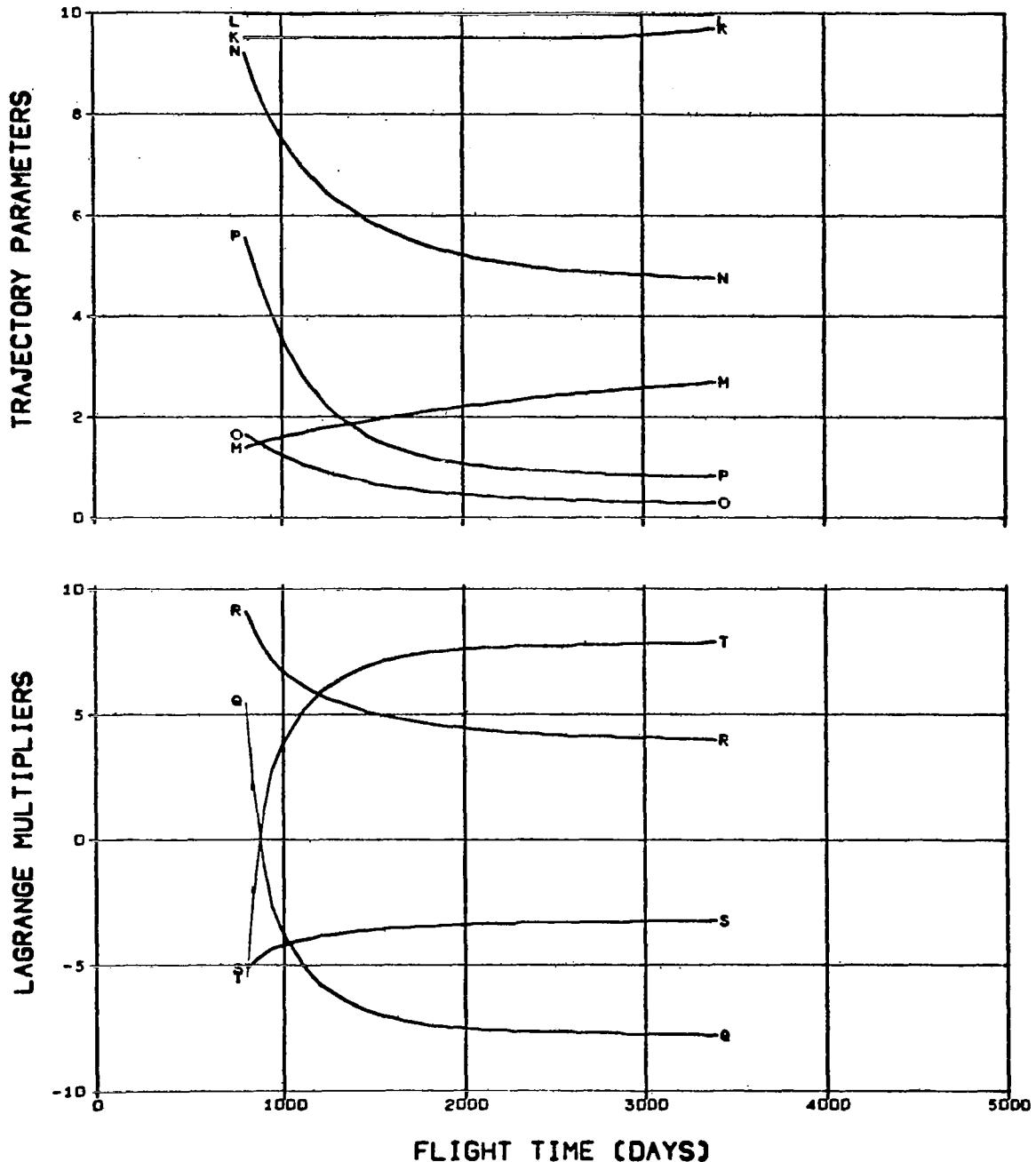


FIG. 6.4.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPULSION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

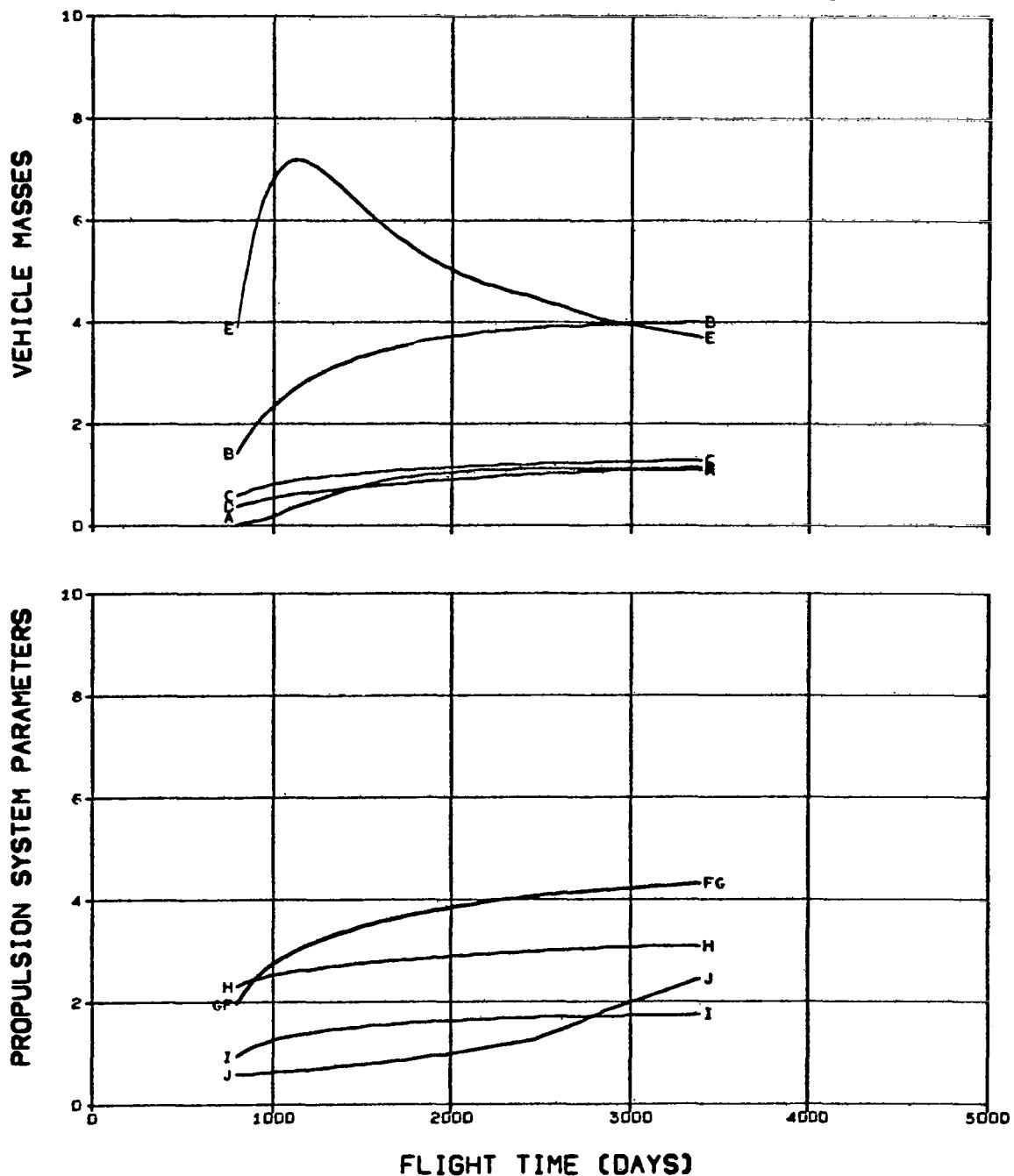


FIG. 6.4.3 SATURN MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.00E-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

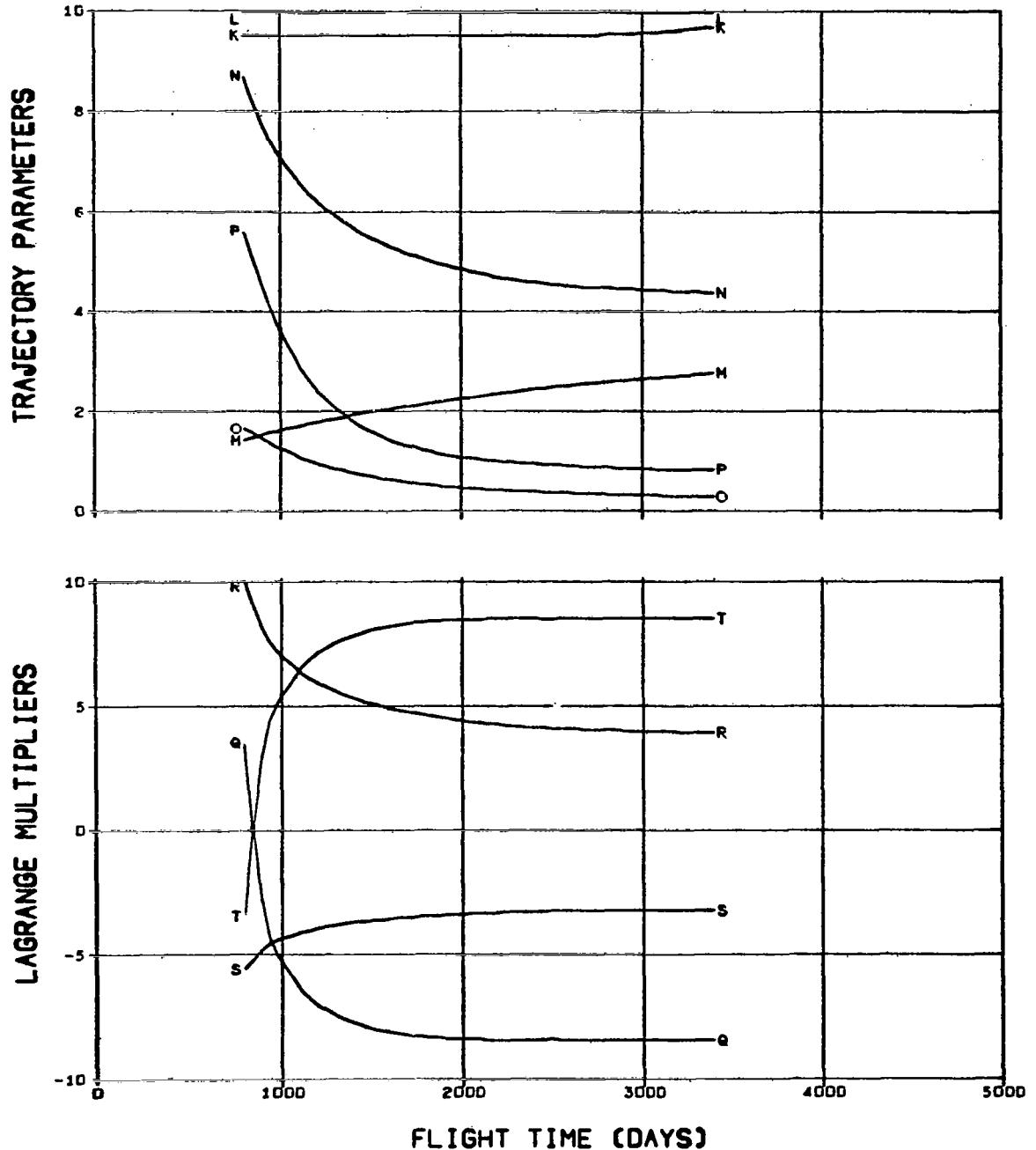


FIG. 6.4.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

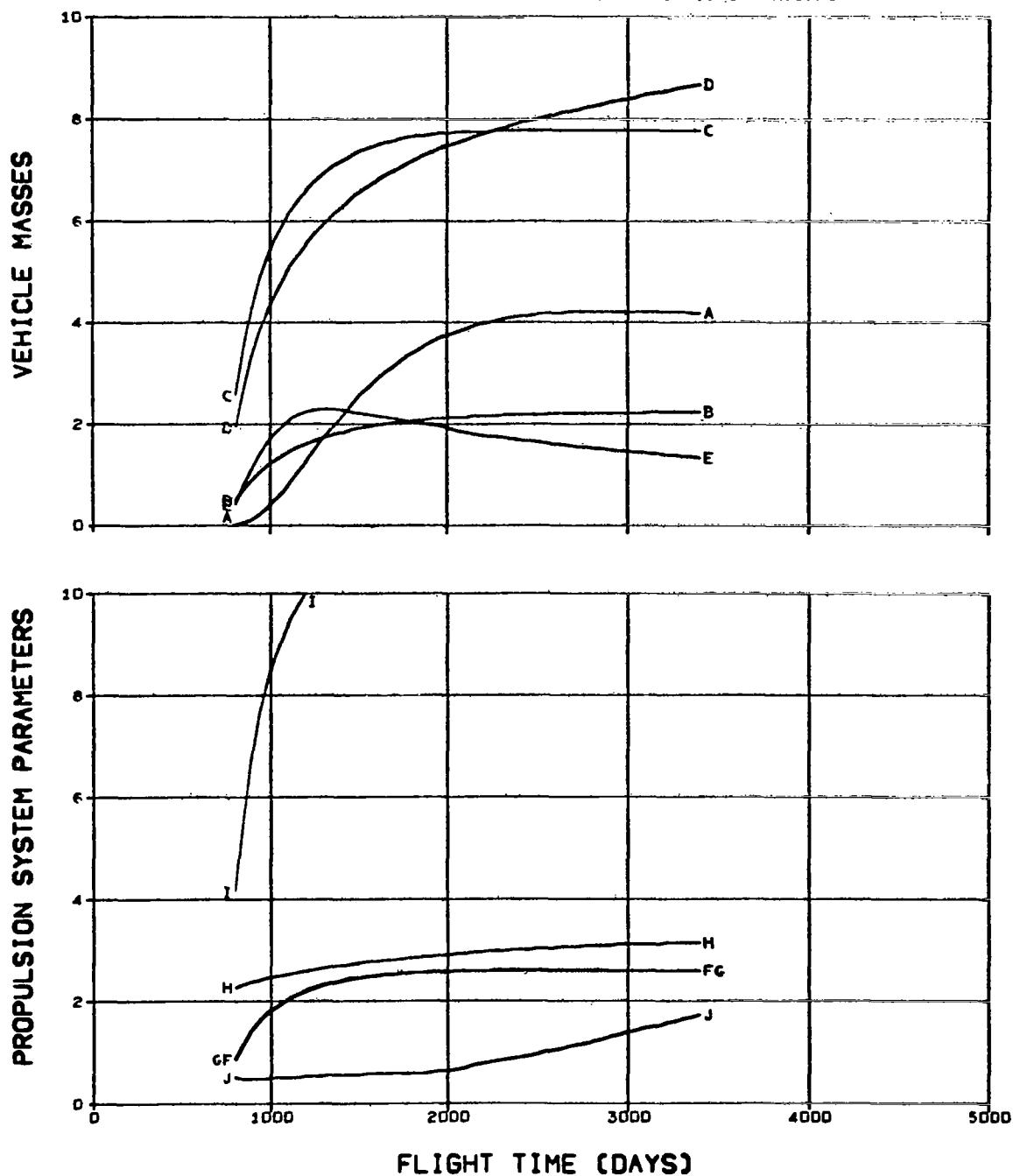


FIG. 6.4.4 SATURN MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

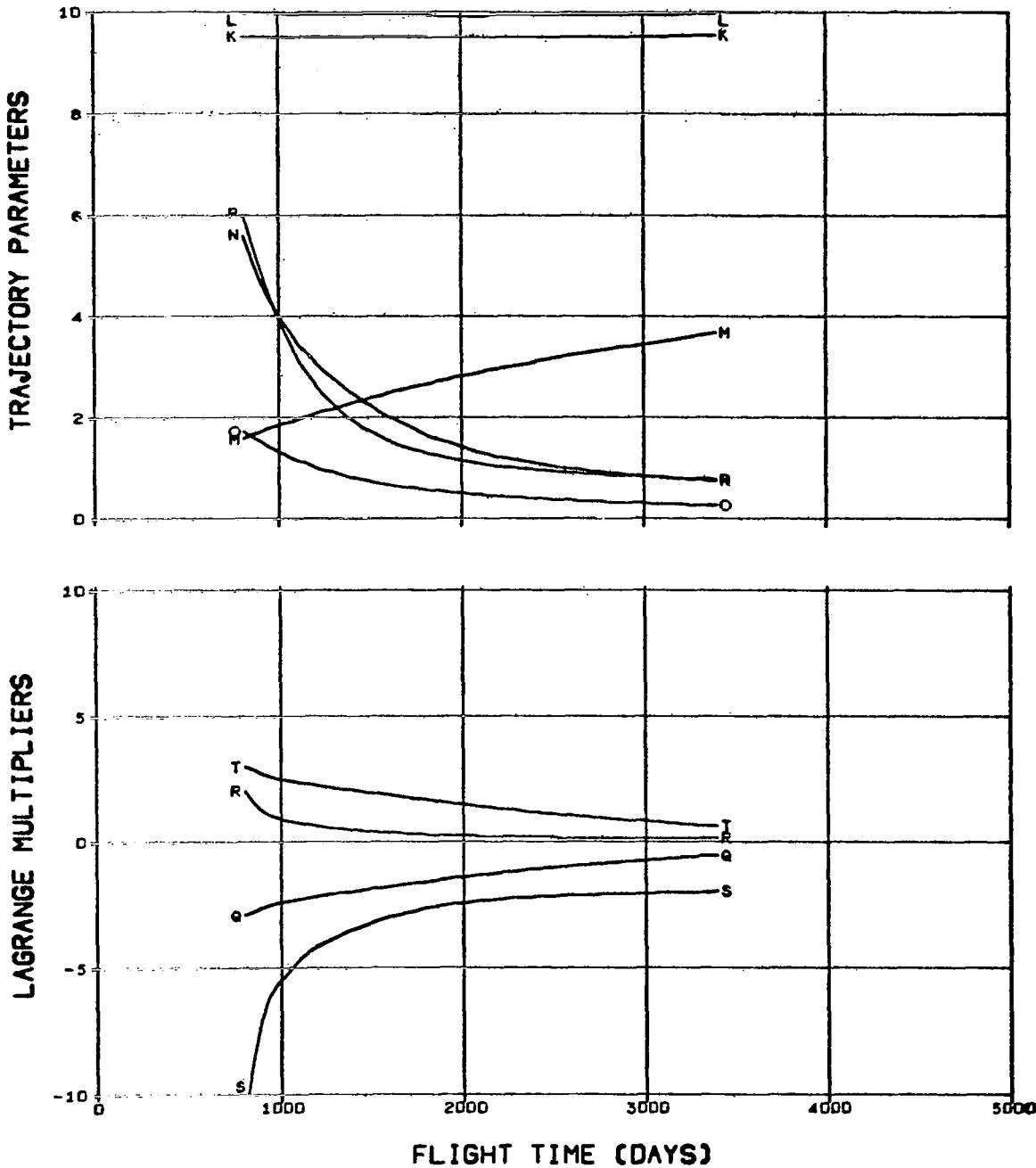


FIG. 6.4.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

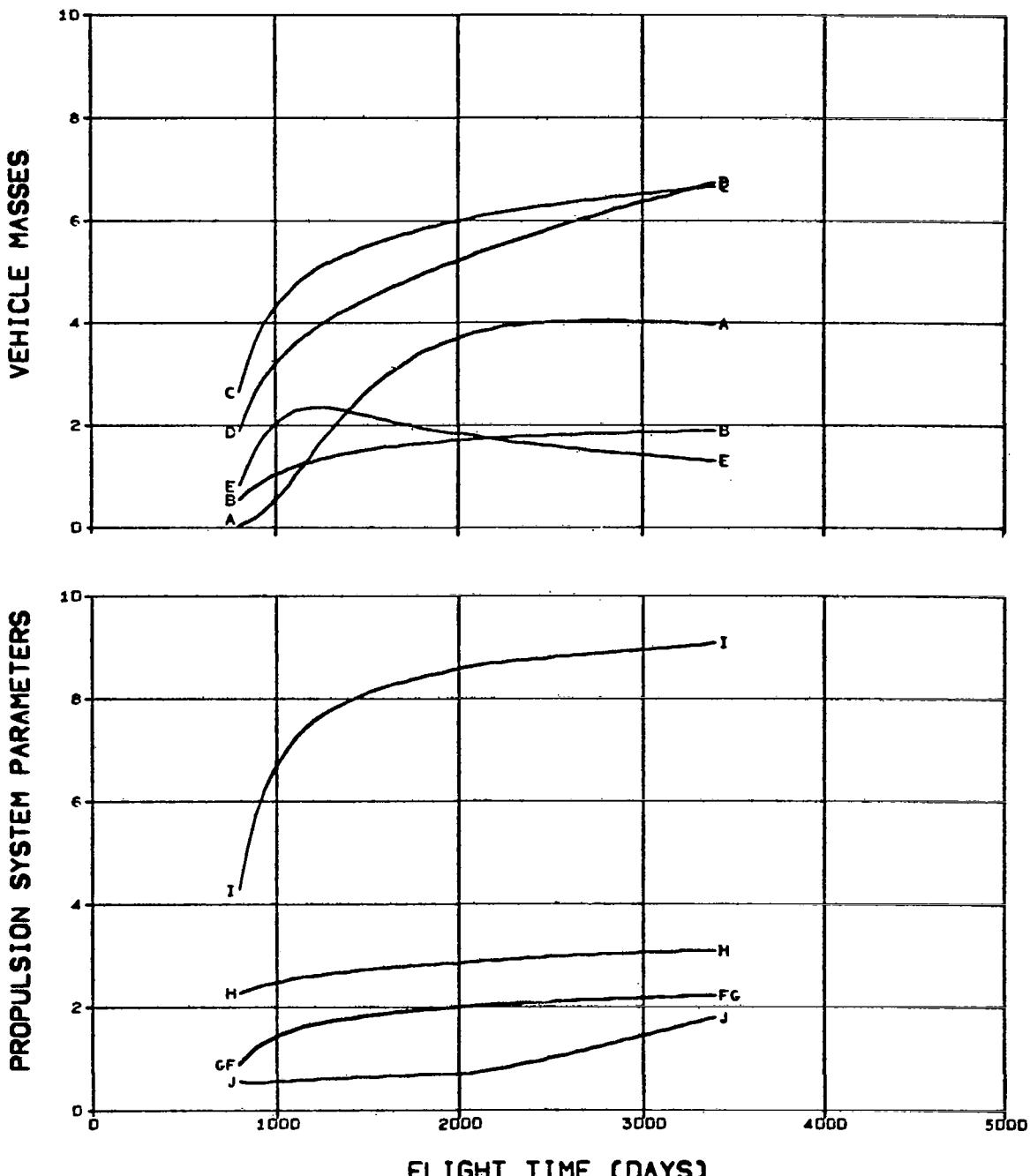


FIG. 6.4.5 SATURN MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

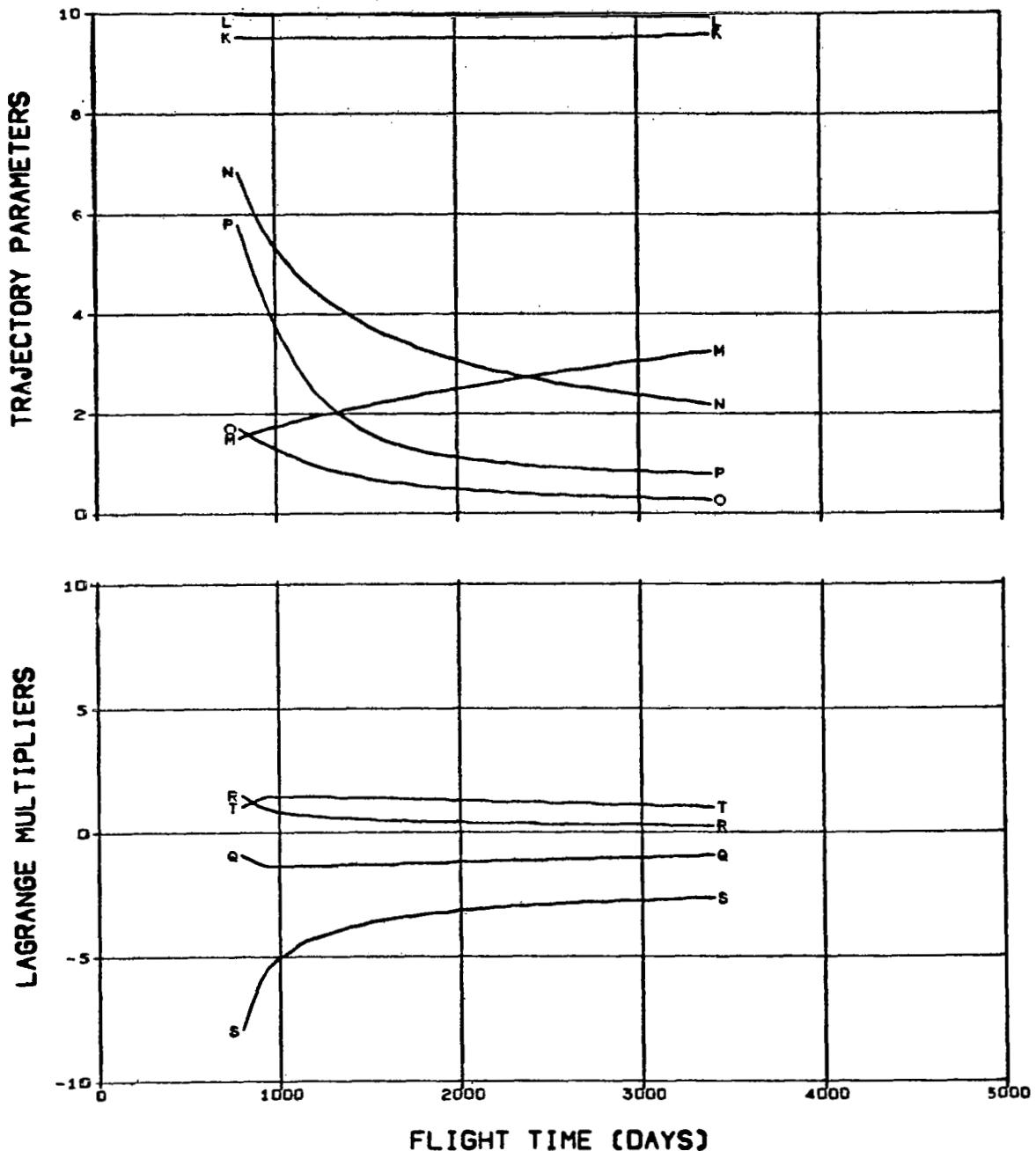


FIG. 6.4.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)/1.0DE-1
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/1000

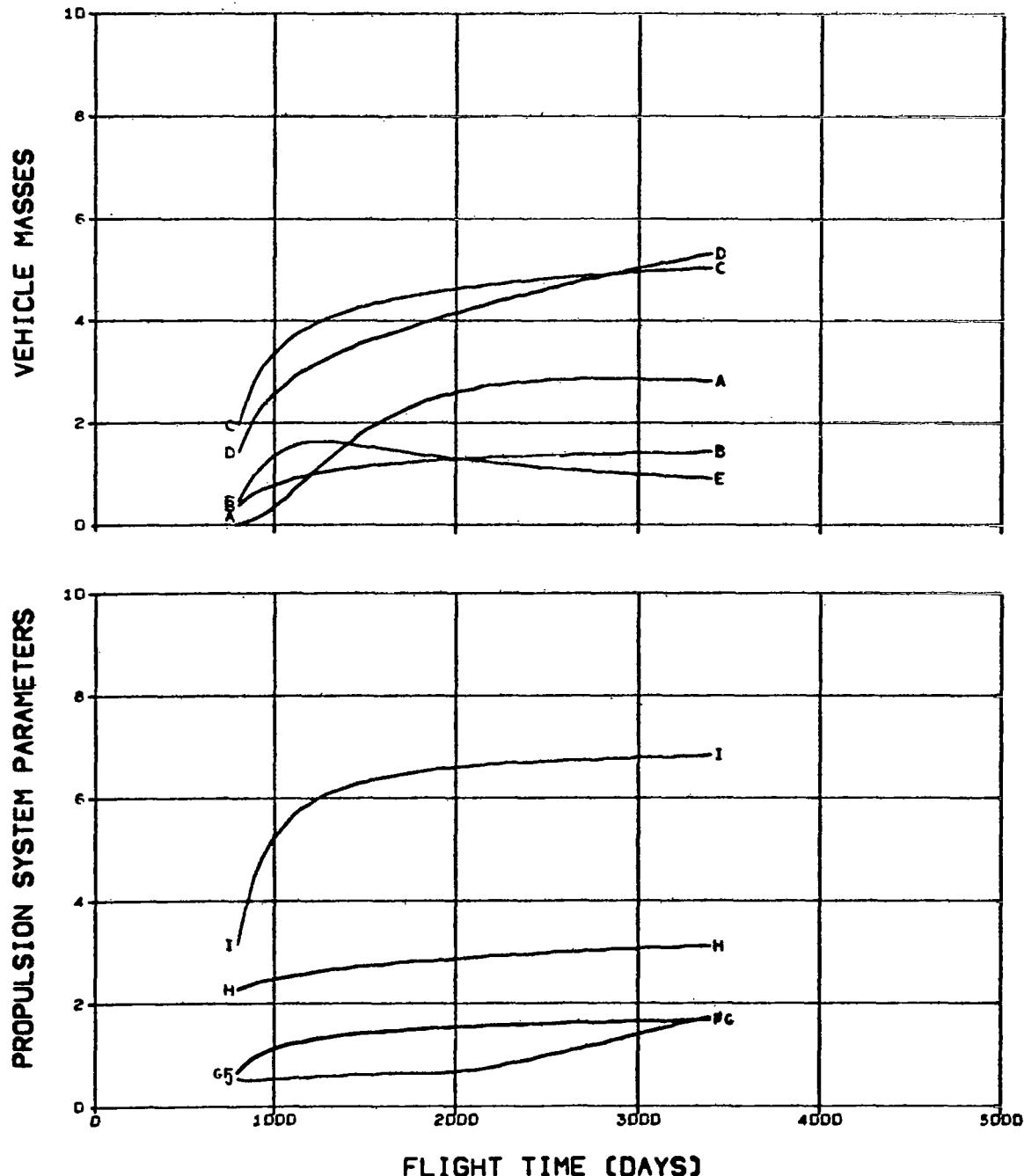


FIG. 6.4.6 SATURN MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

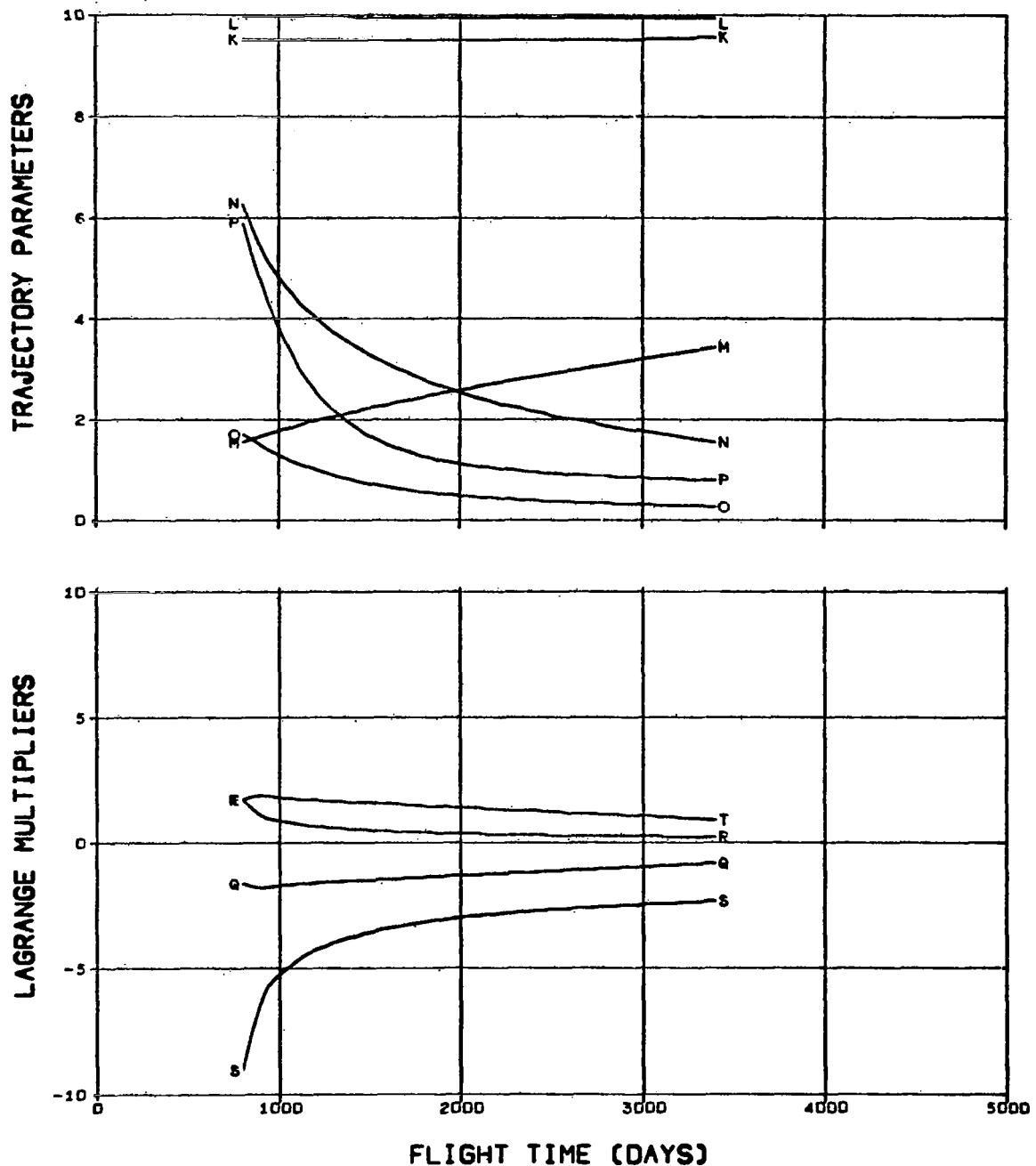


FIG. 6.4.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/1000

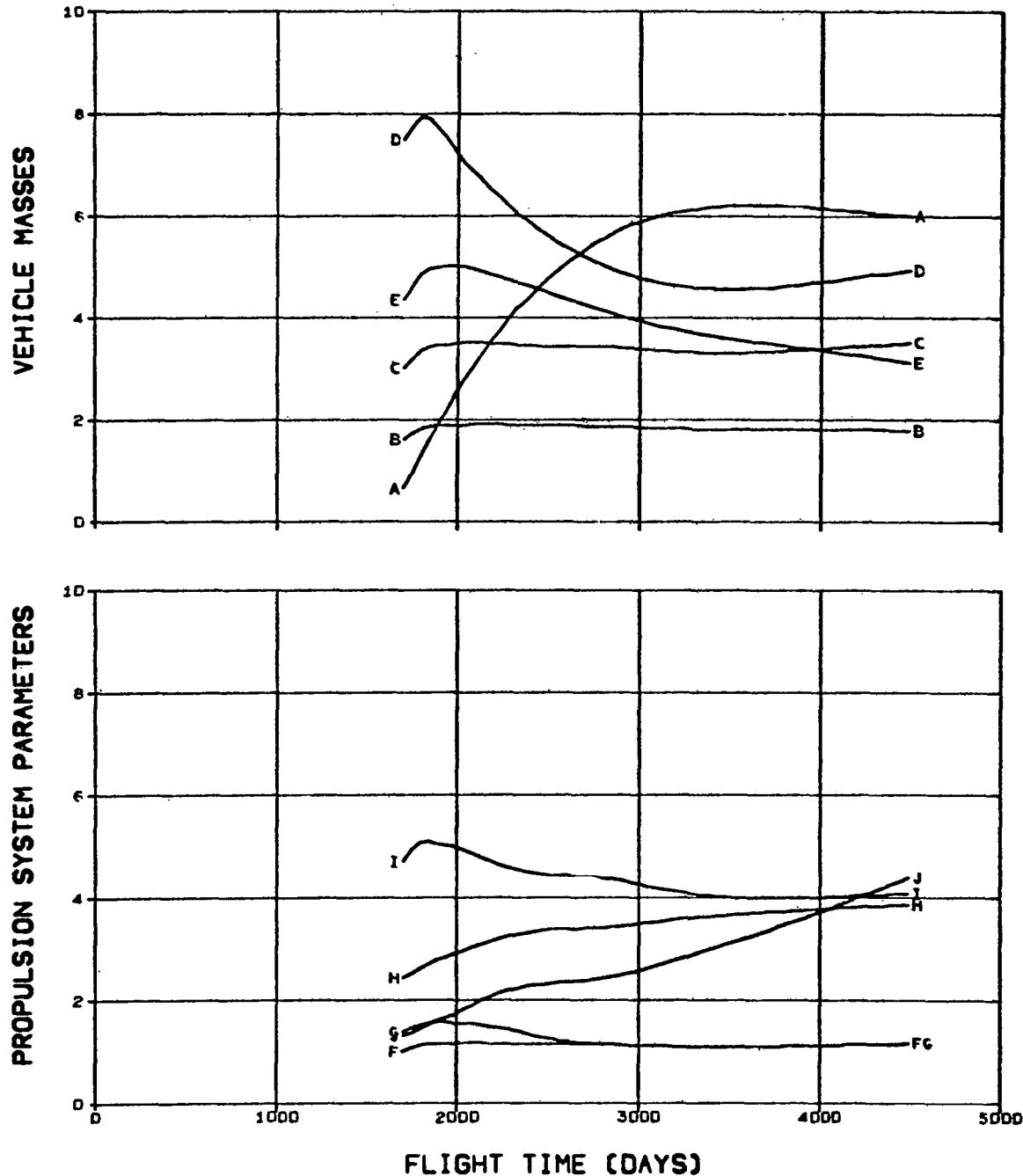


FIG. 6.5.1 SATURN MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

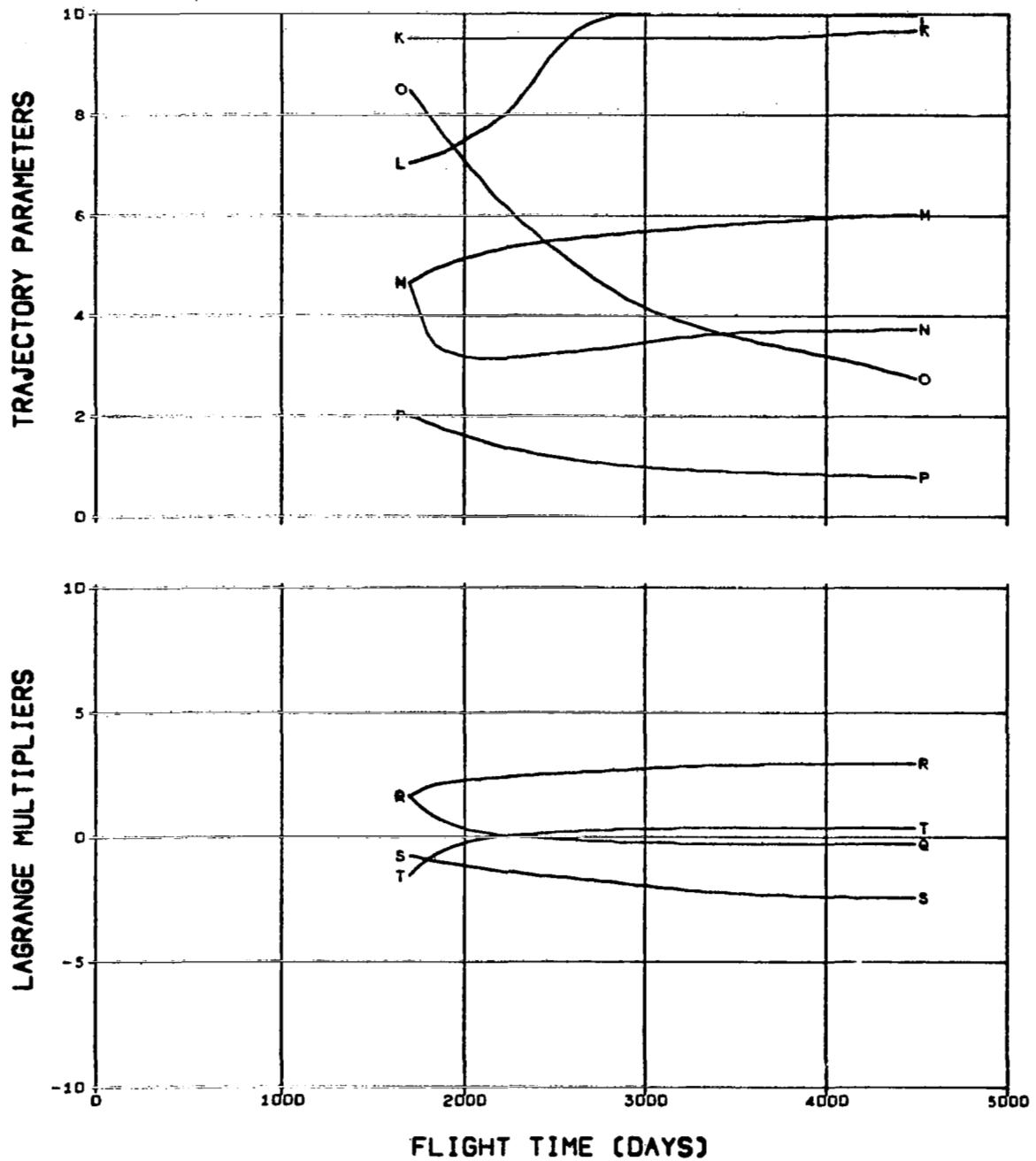
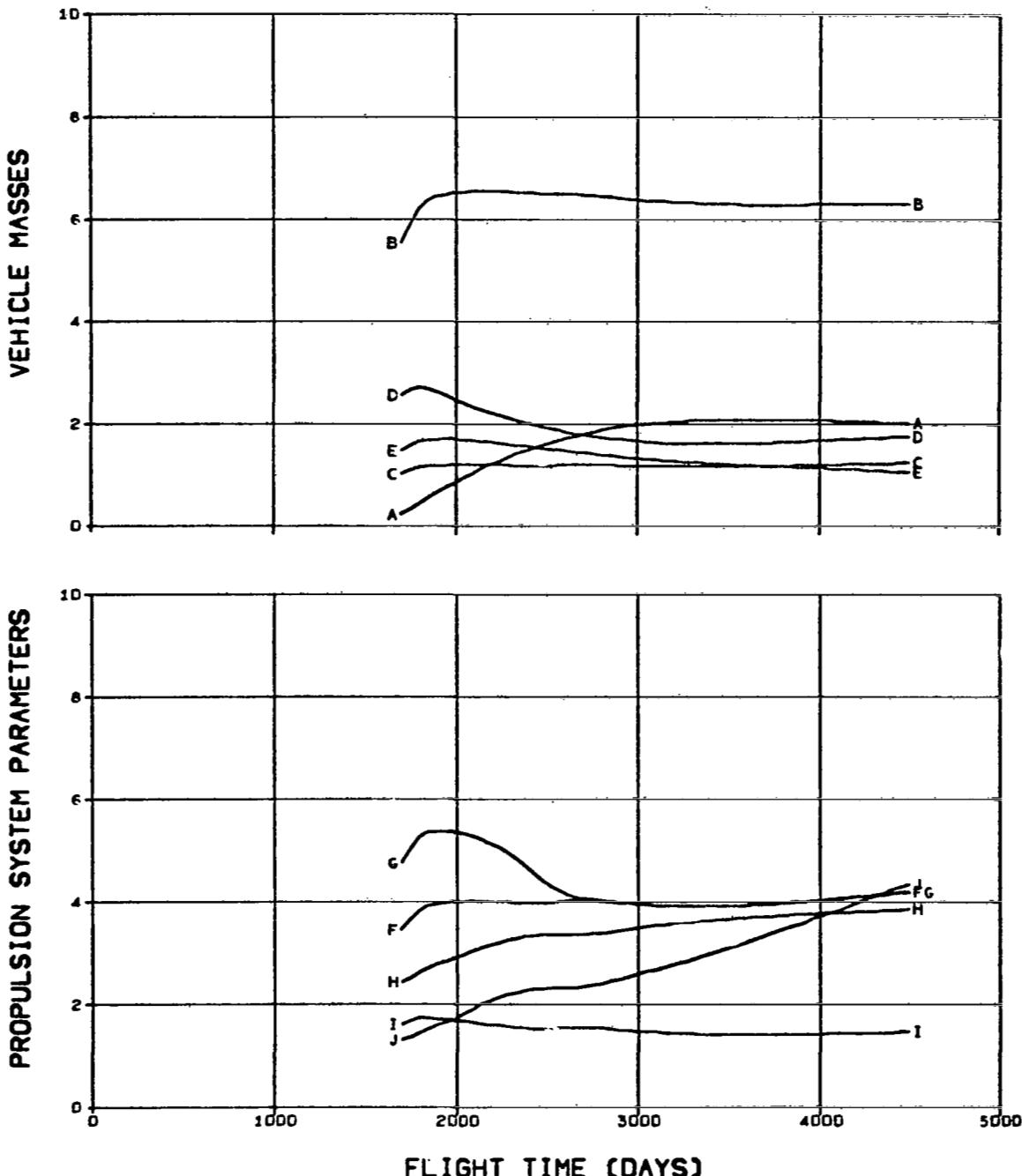


FIG. 6.5.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 6.5.2 SATURN MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE

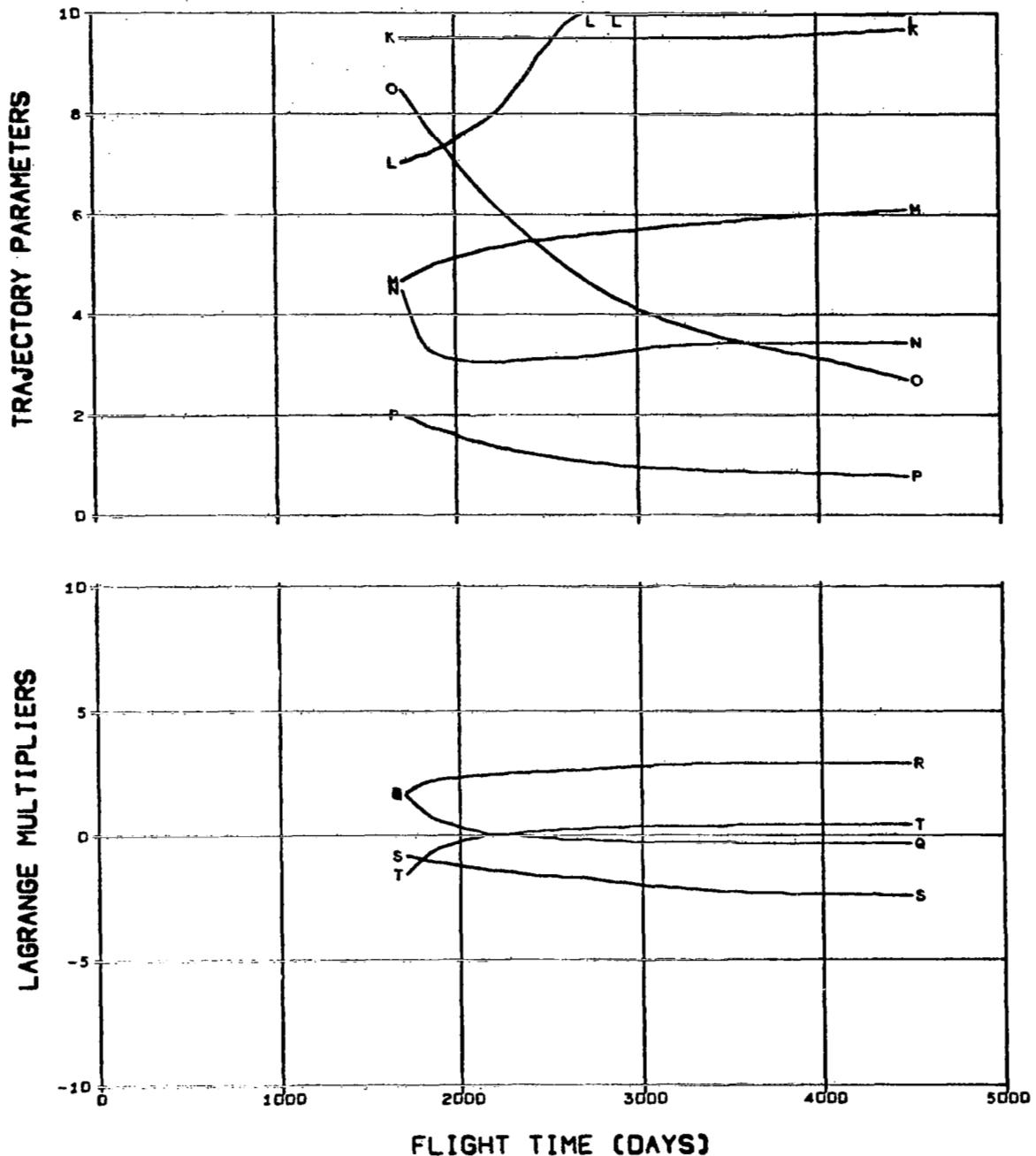


FIG. 6.5.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/1000	J PROPULSION TIME (DAYS)/1000

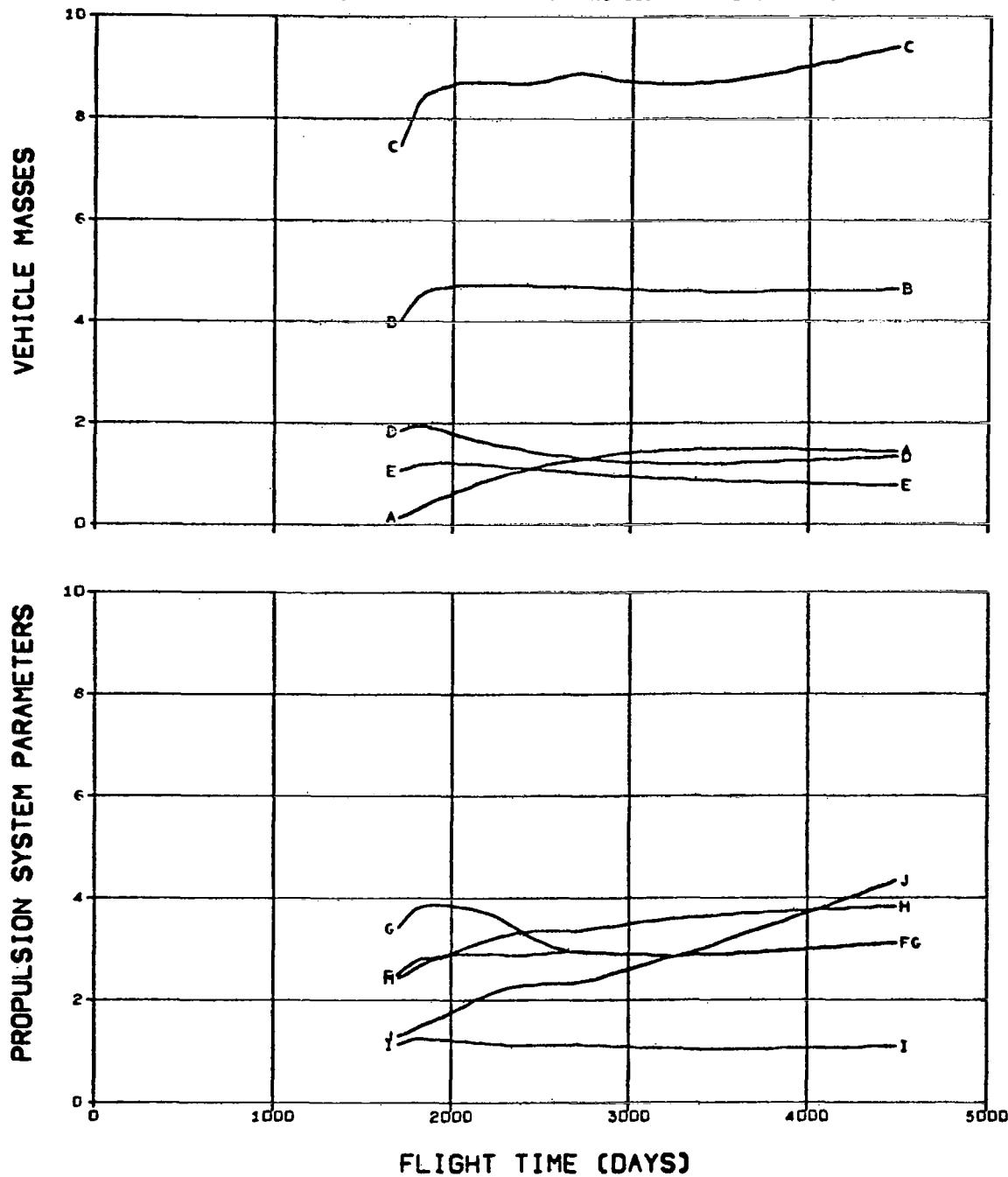


FIG. 6.5.3 SATURN MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

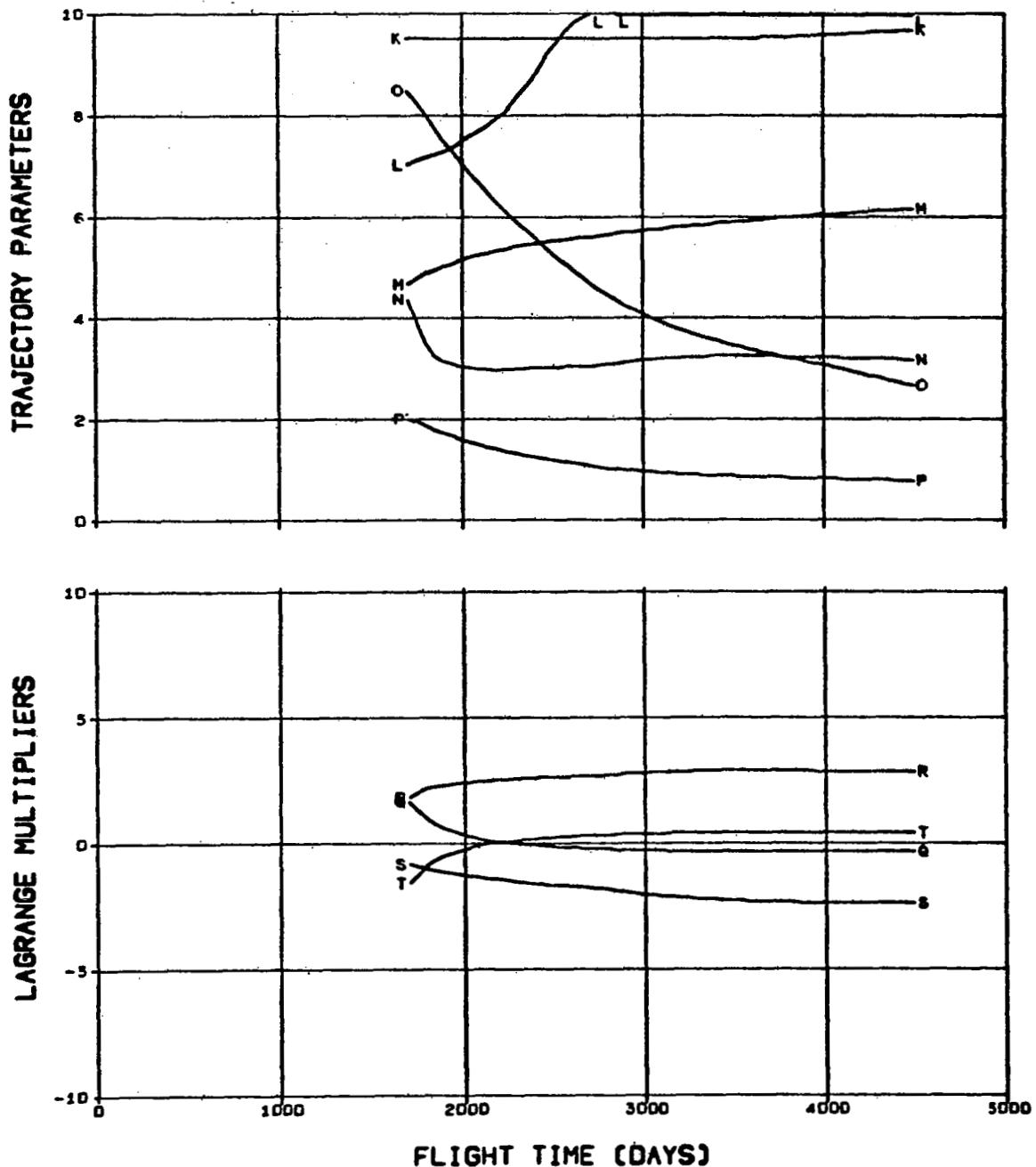


FIG. 6.5.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

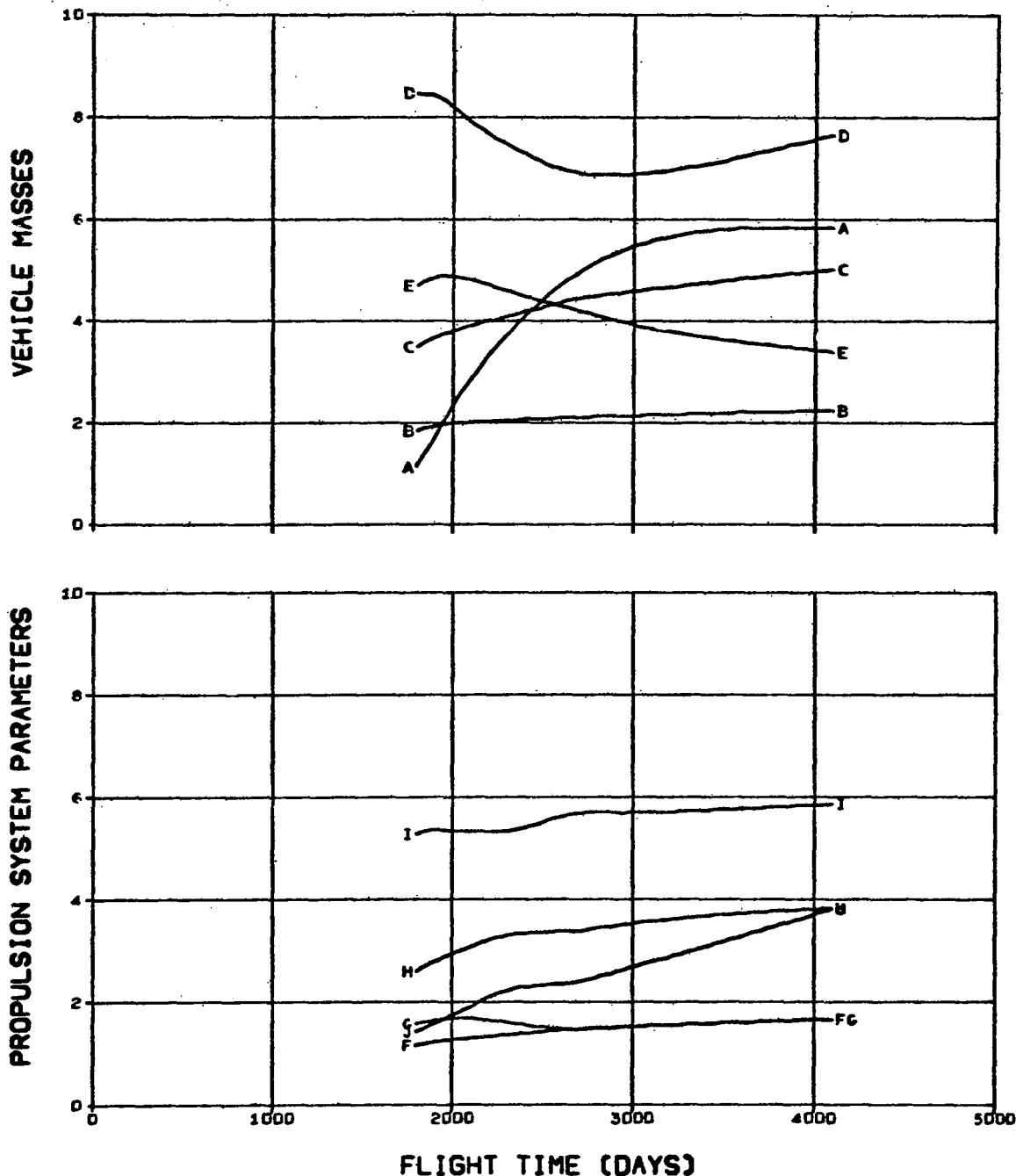


FIG. 6.5.4 SATURN MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEC)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

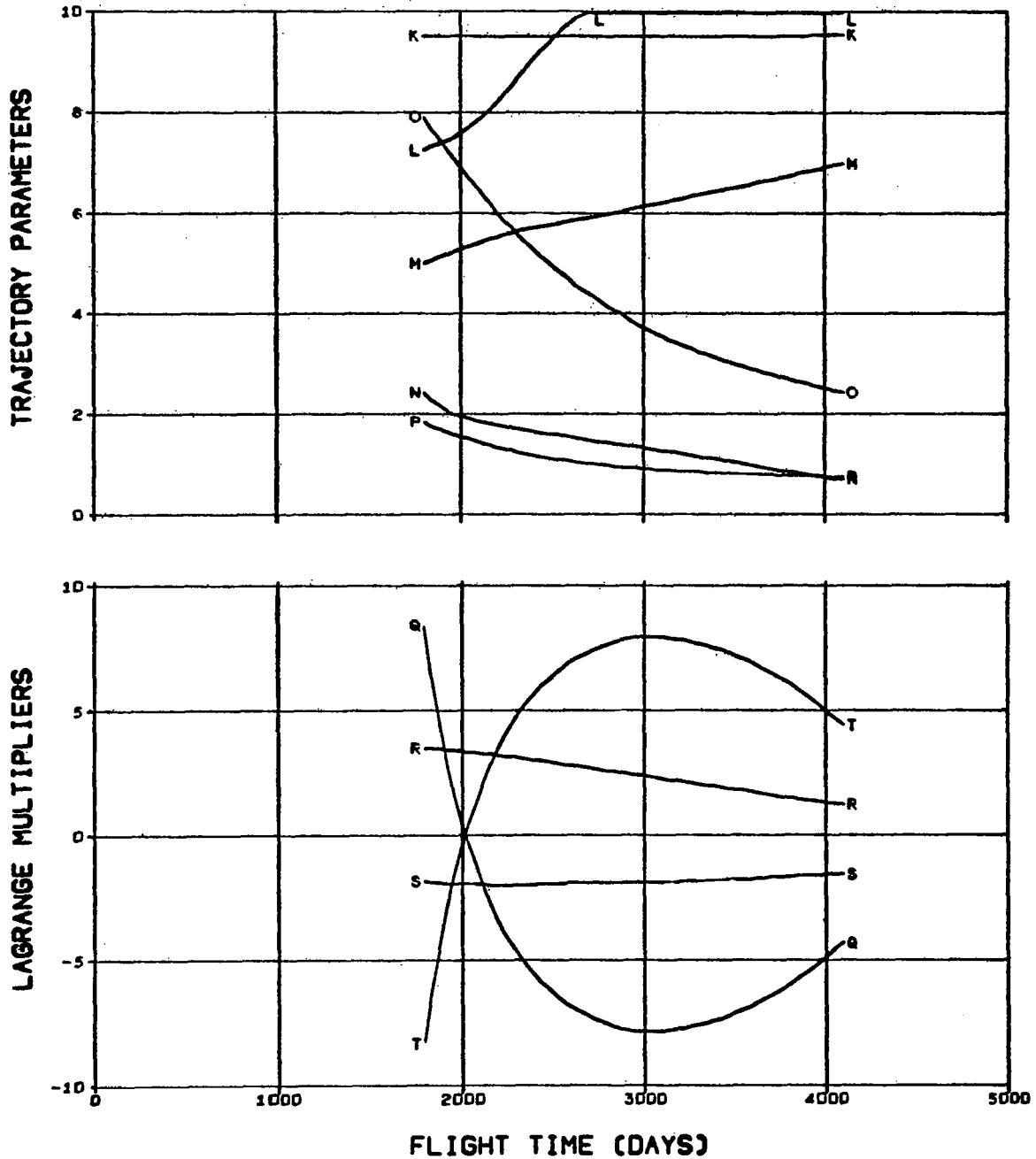
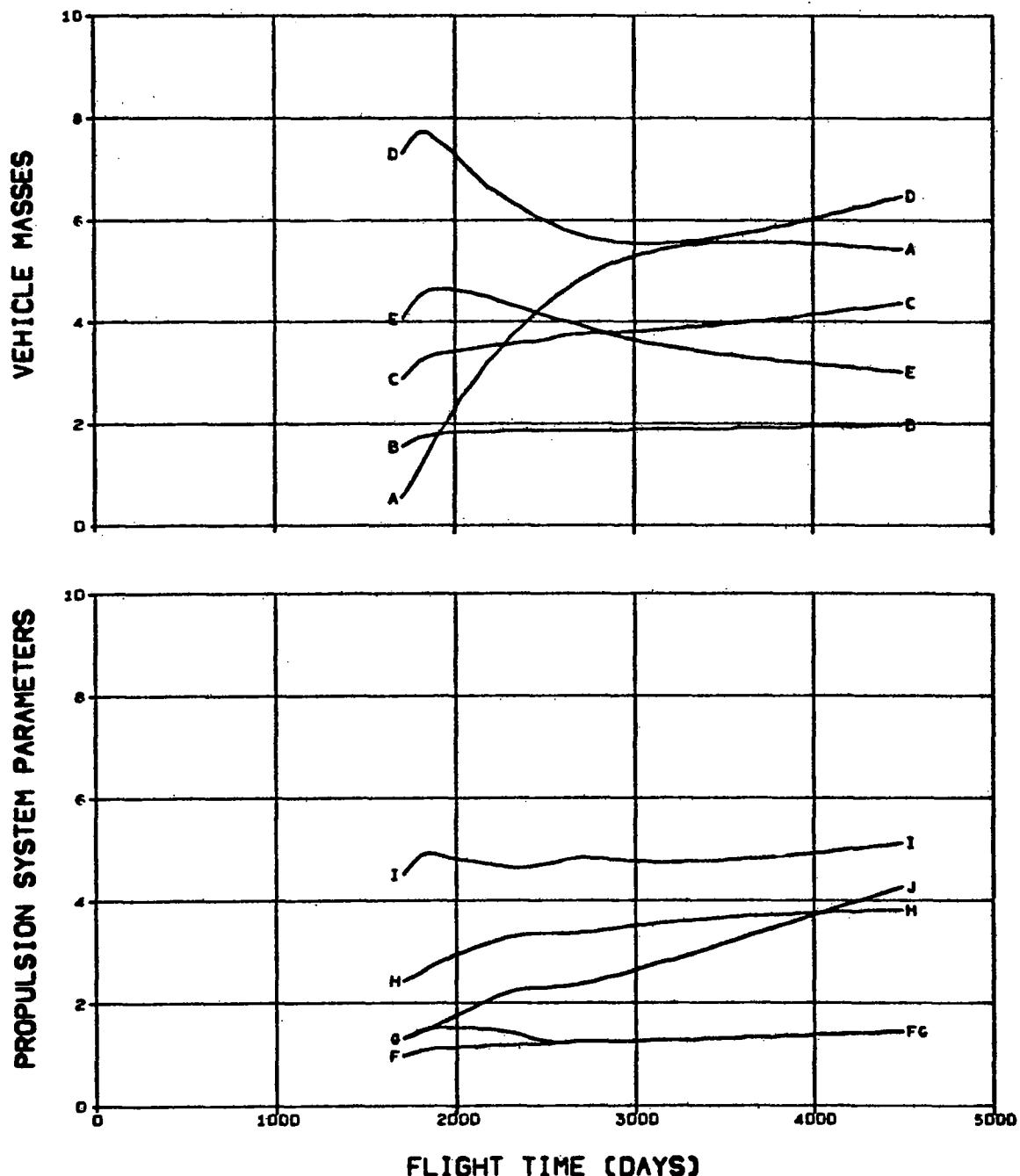


FIG. 6.5.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 6.5.5 SATURN MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

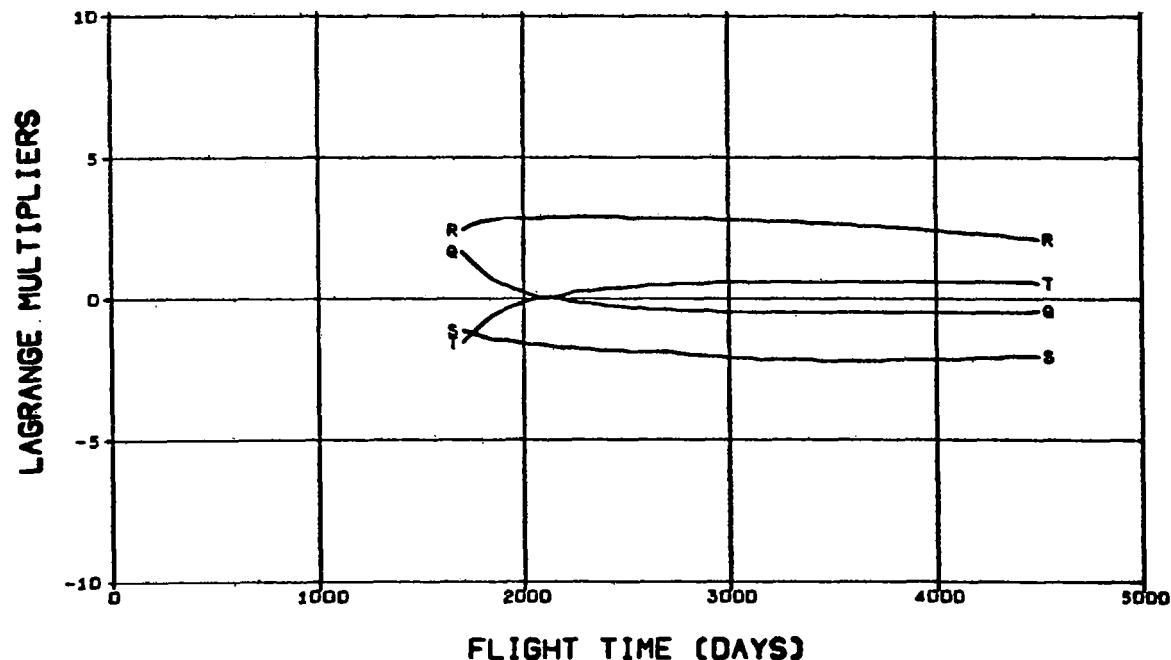
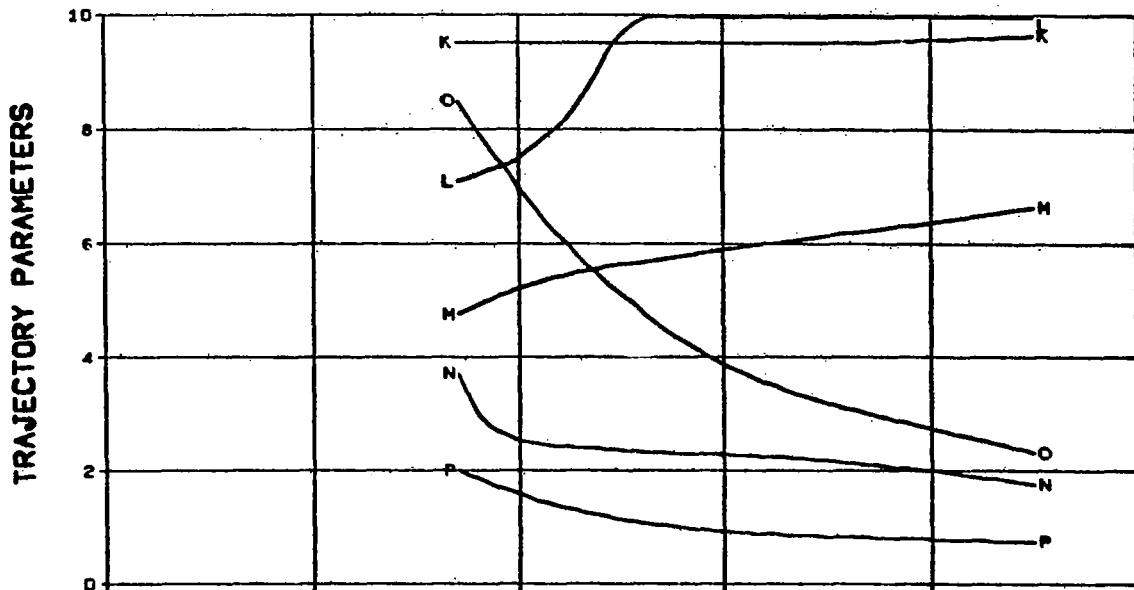
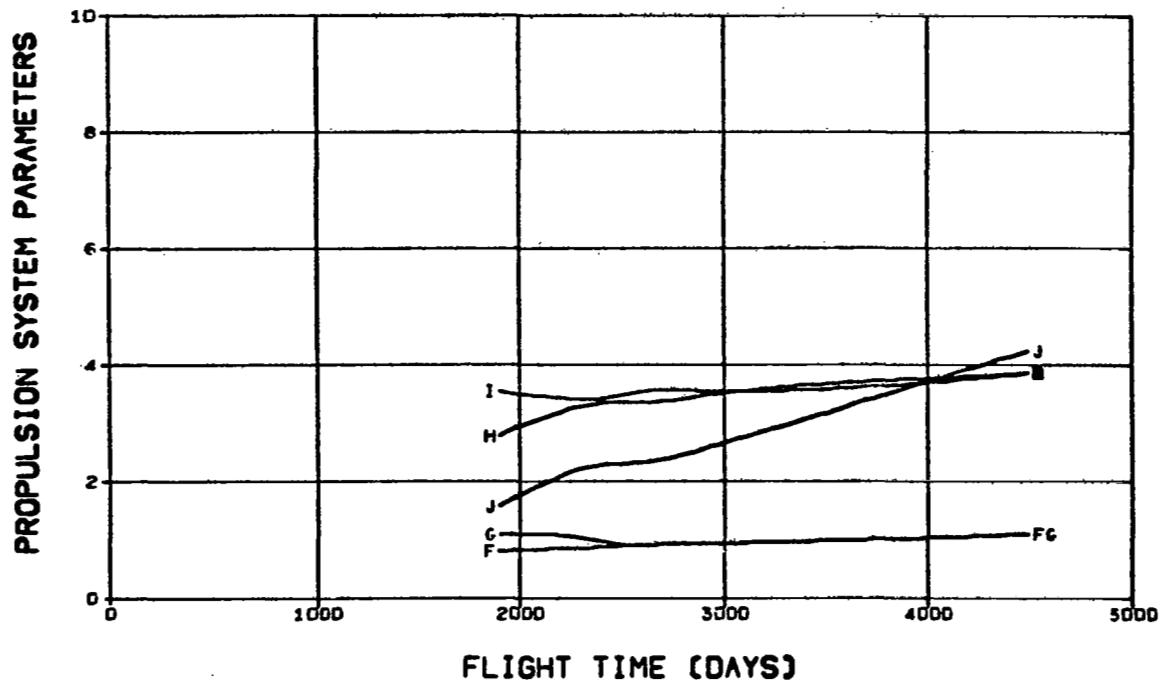
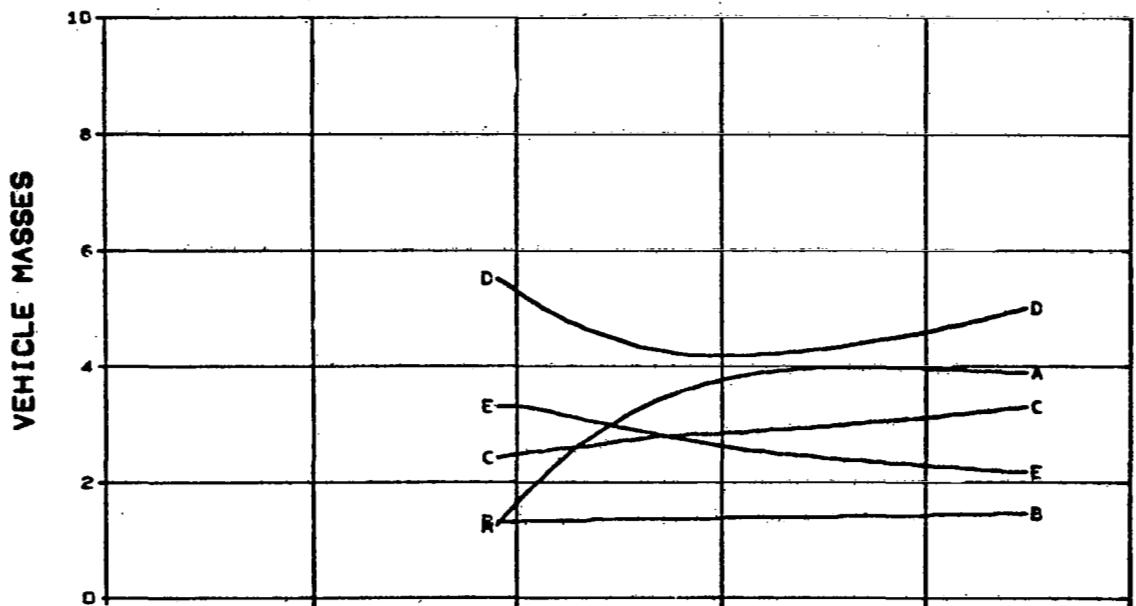


FIG. 6.5.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 6.5.6 SATURN MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

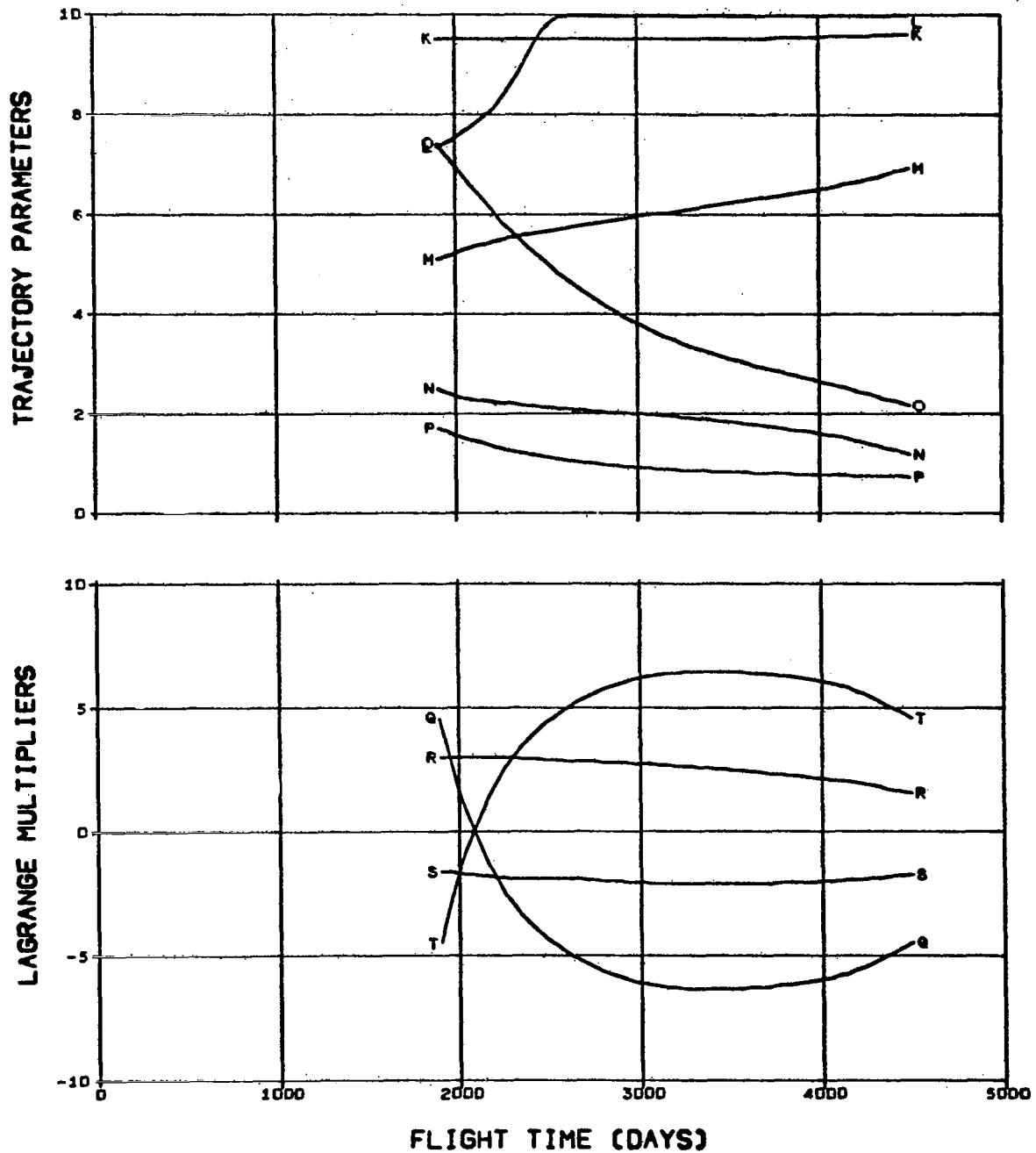


FIG. 6.5.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

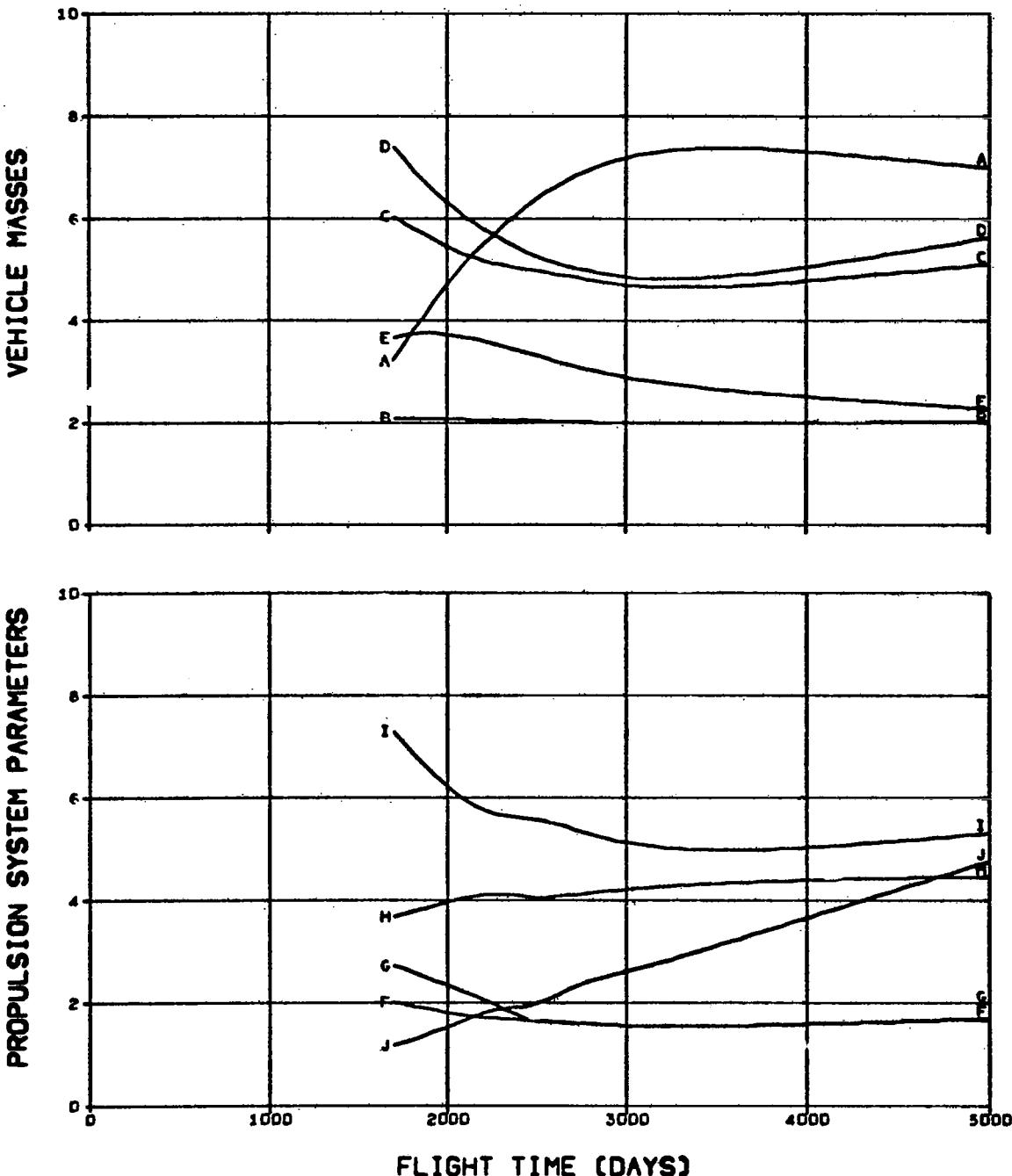


FIG. 6.6.1 SATURN MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.00E-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

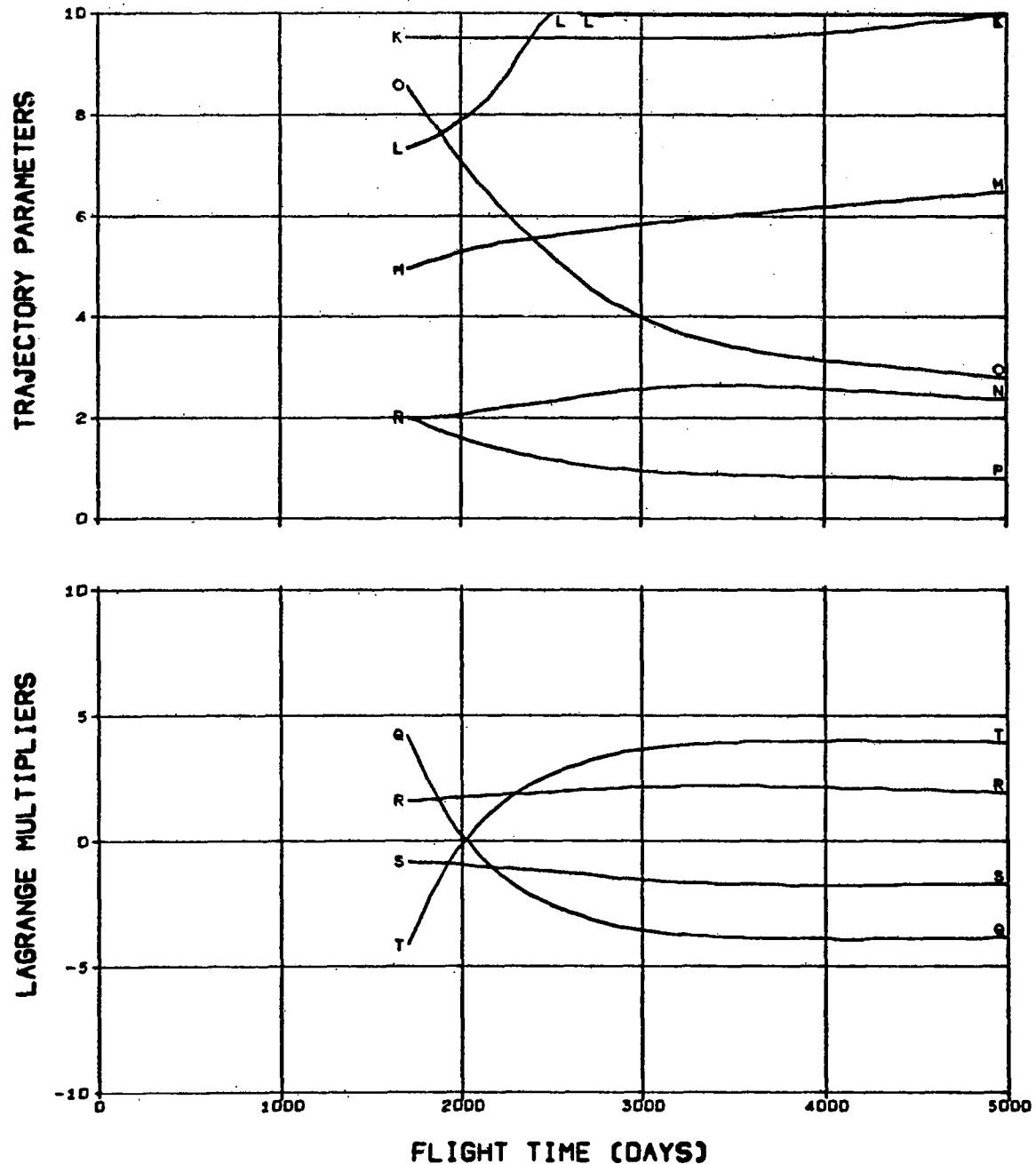


FIG. 6.6.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

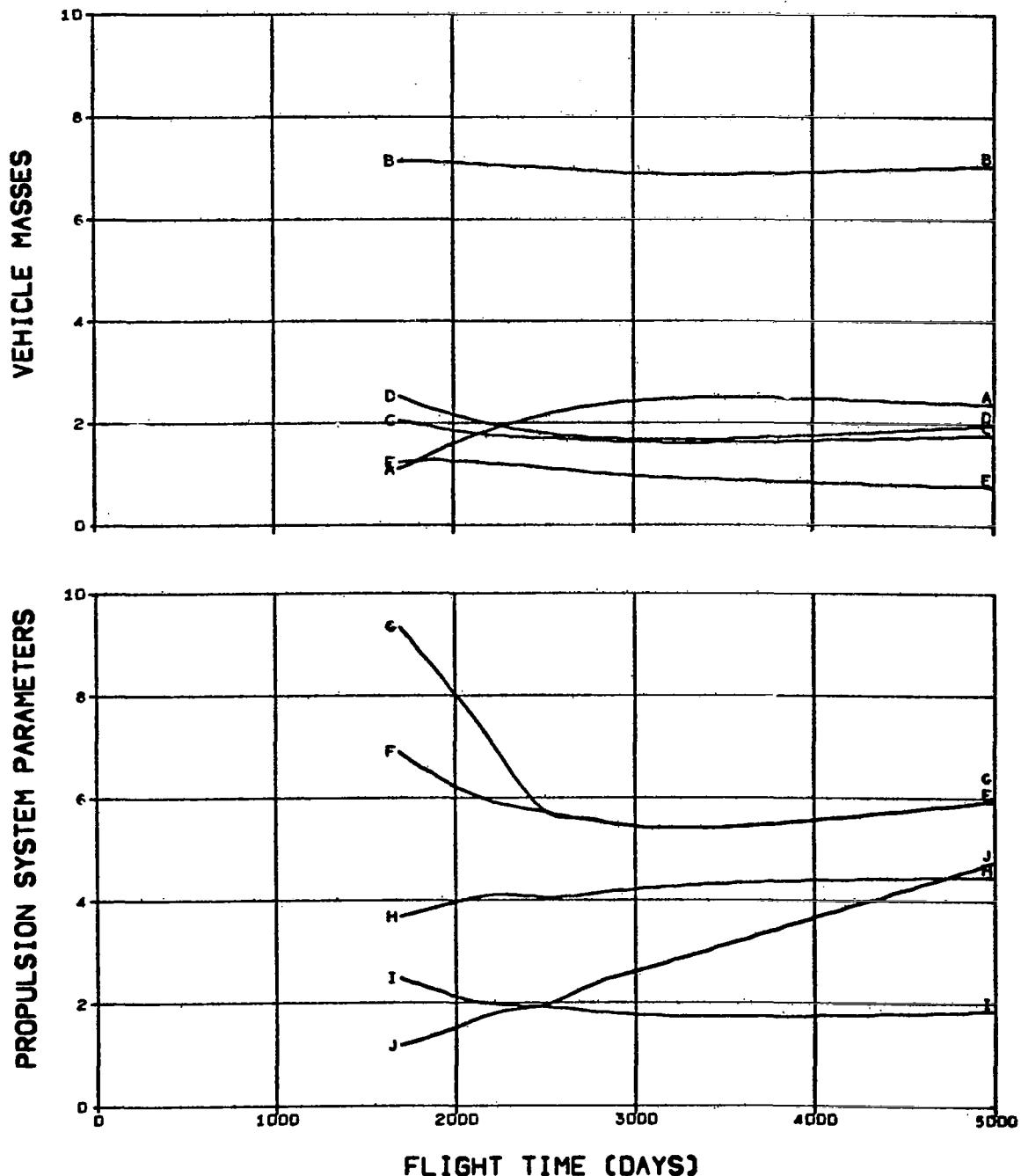


FIG. 6.6.2 SATURN MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU) Q RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEC)/100 S Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 U Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

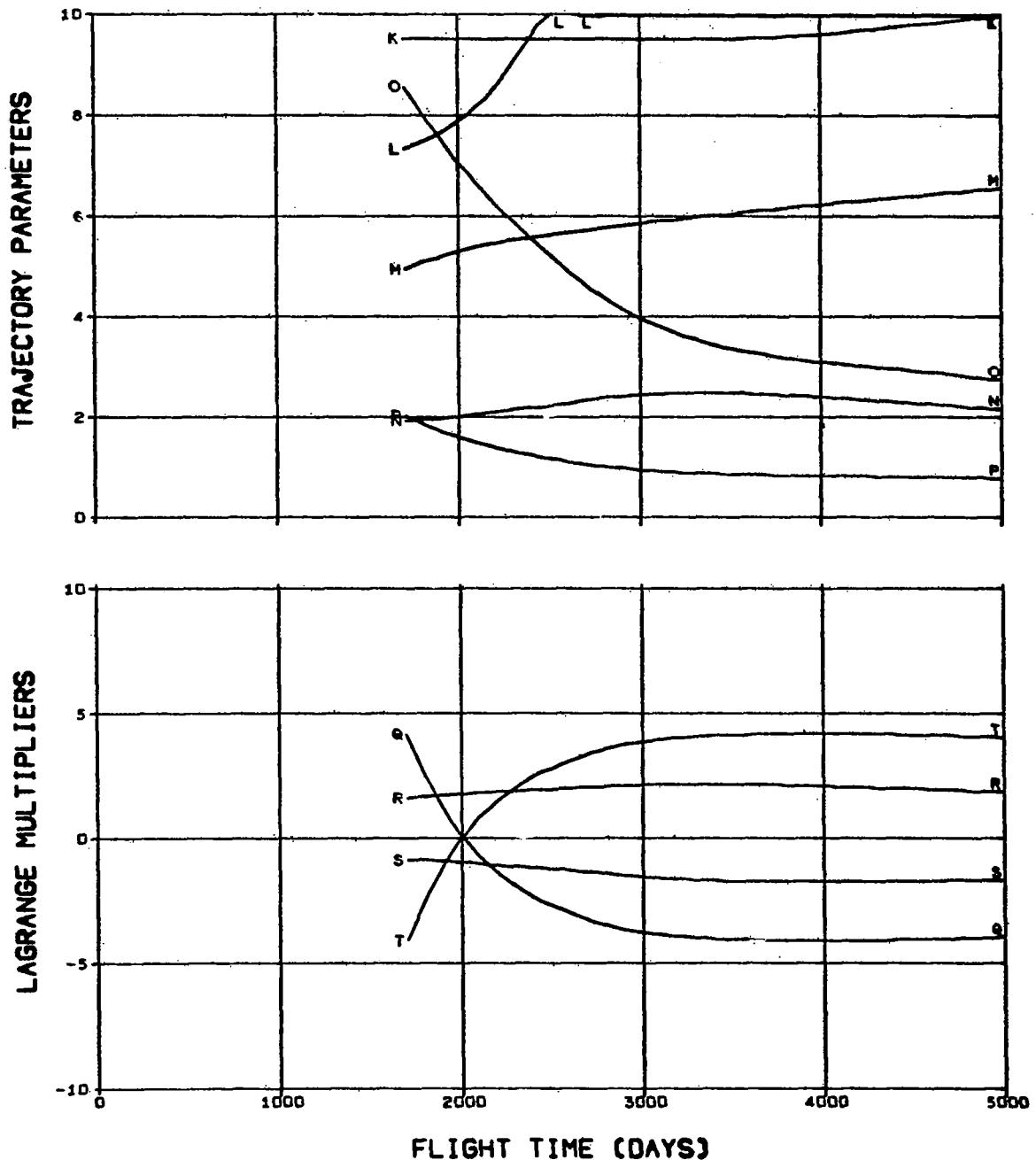
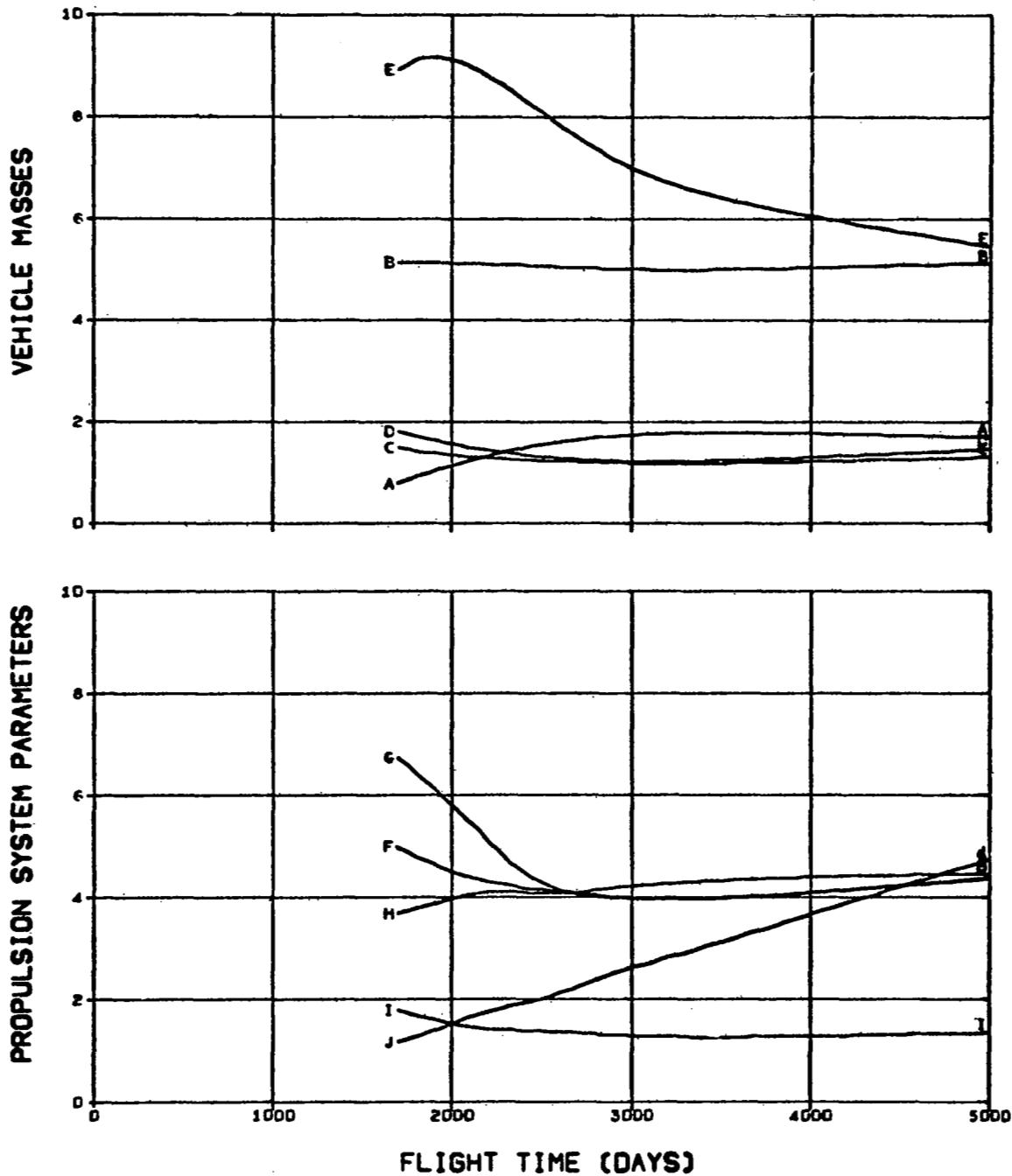


FIG. 6.6.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 6.6.3 SATURN MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)	D	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

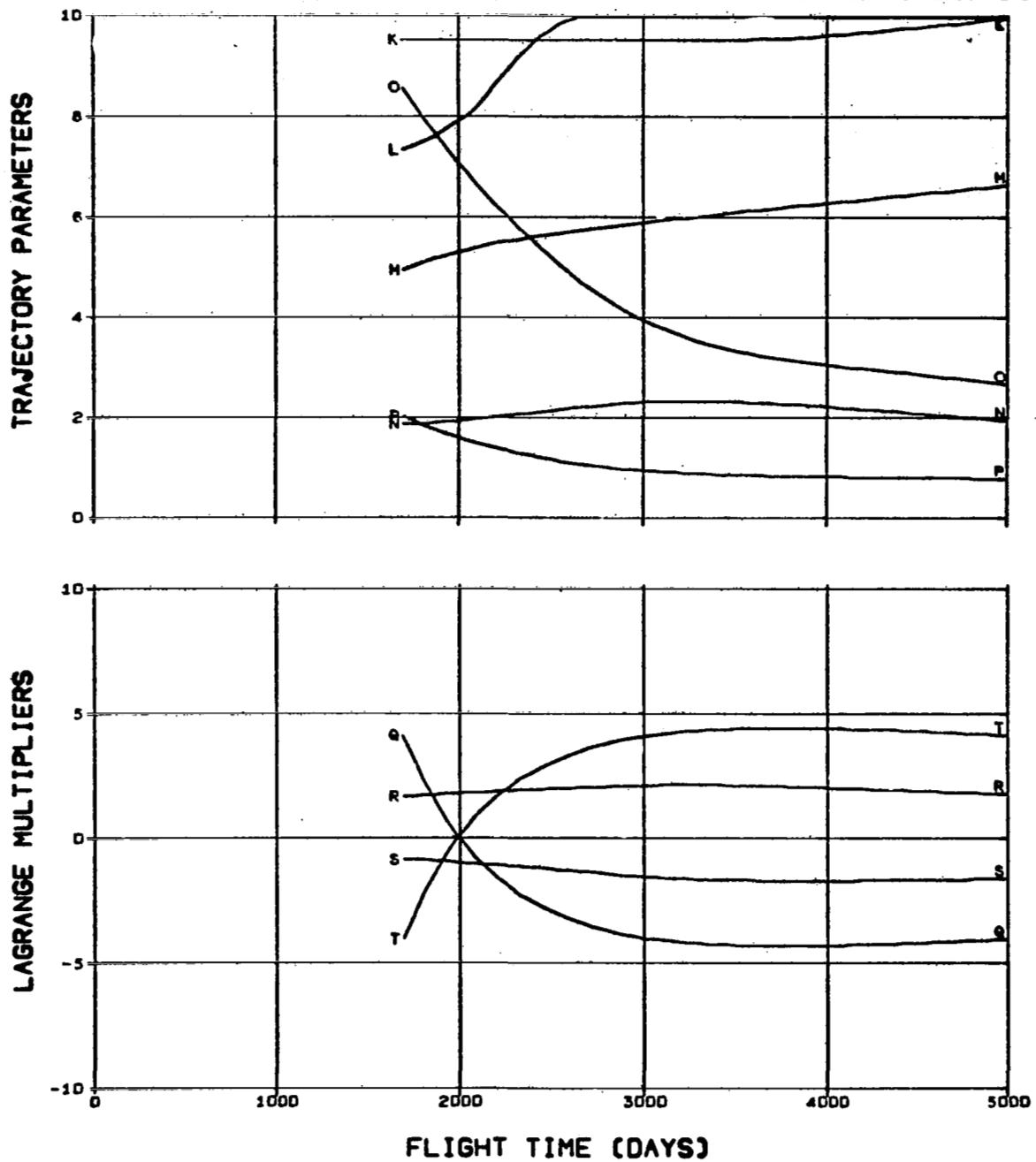


FIG. 6.6.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

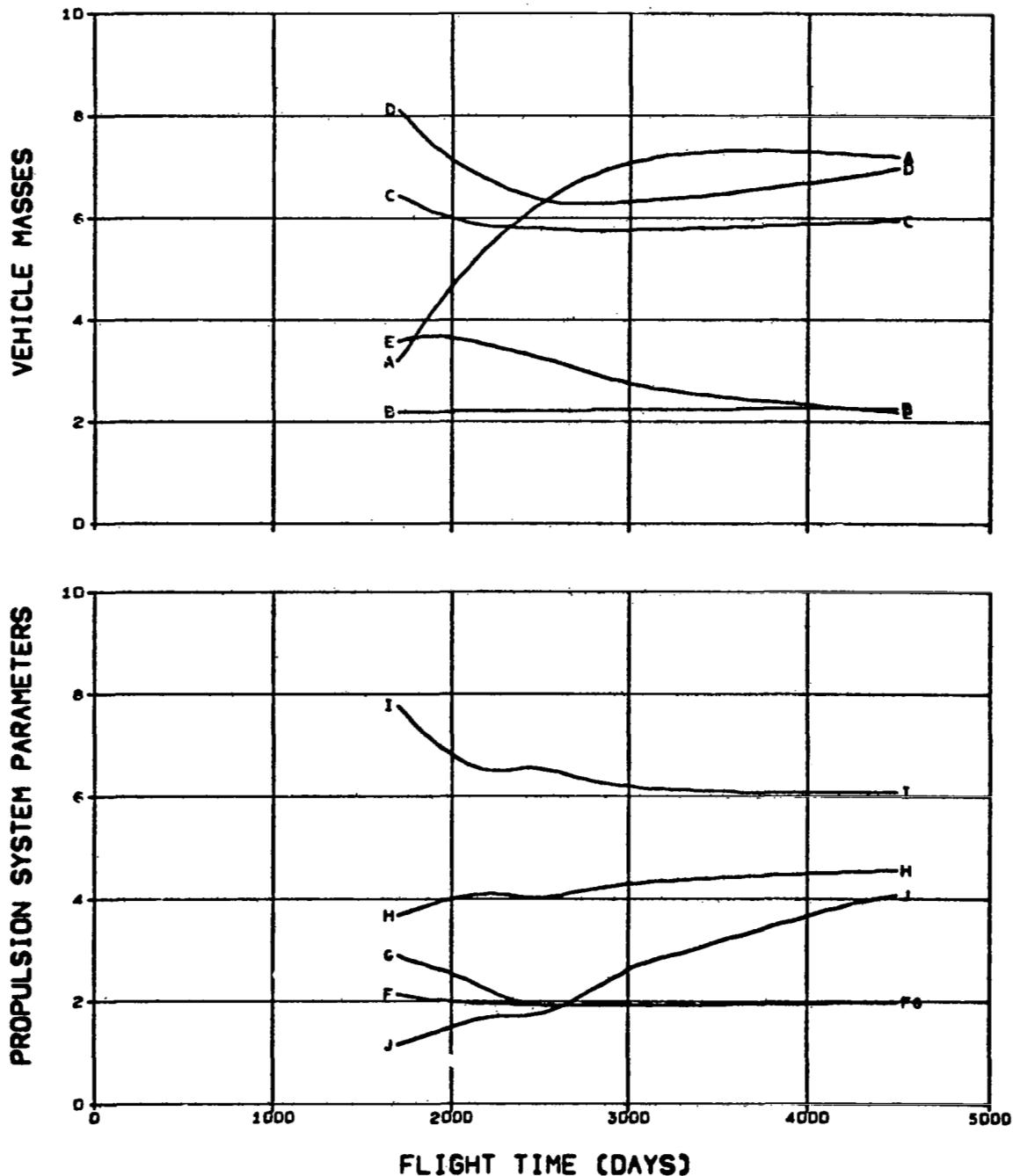


FIG. 6.6.4 SATURN MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

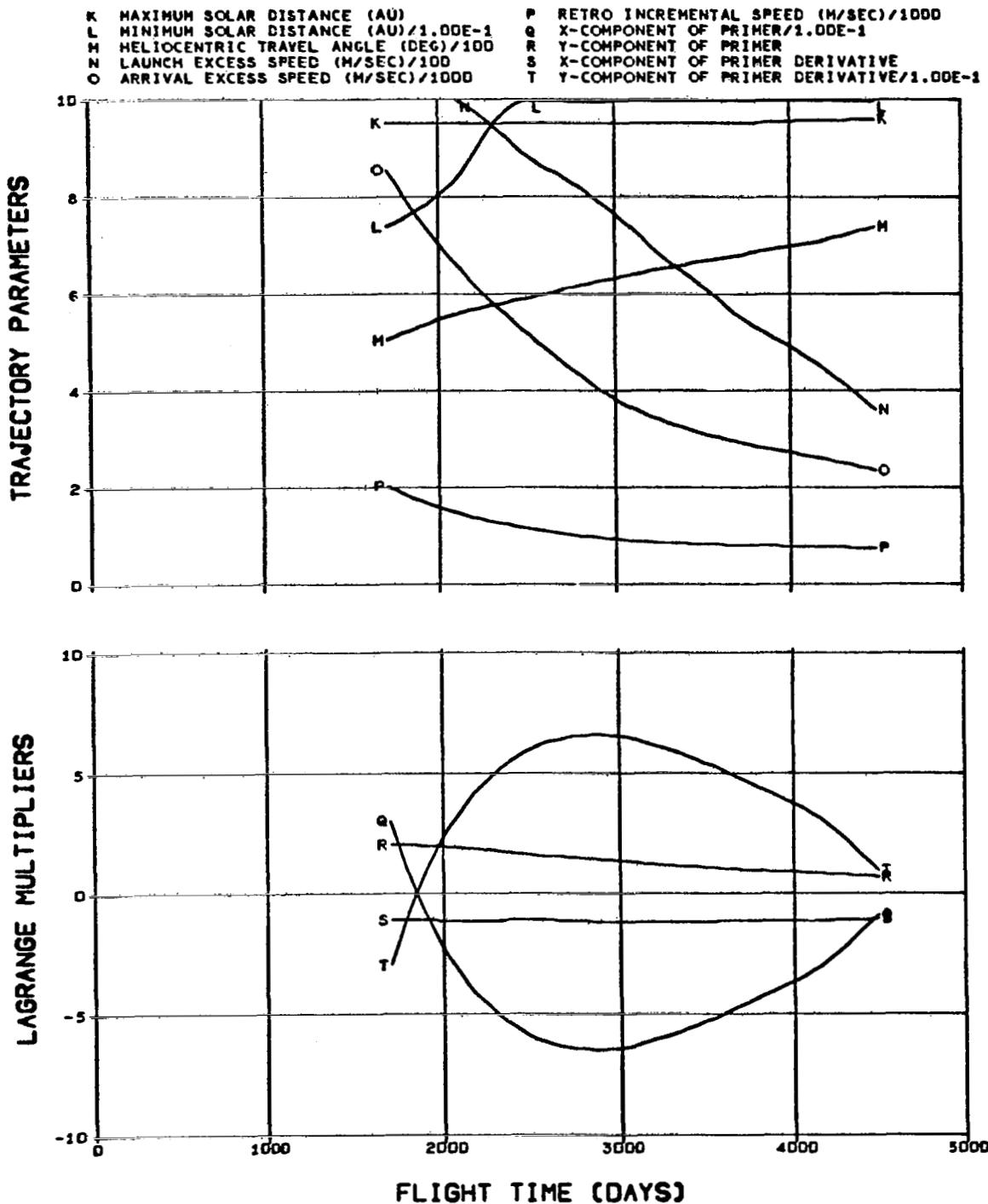
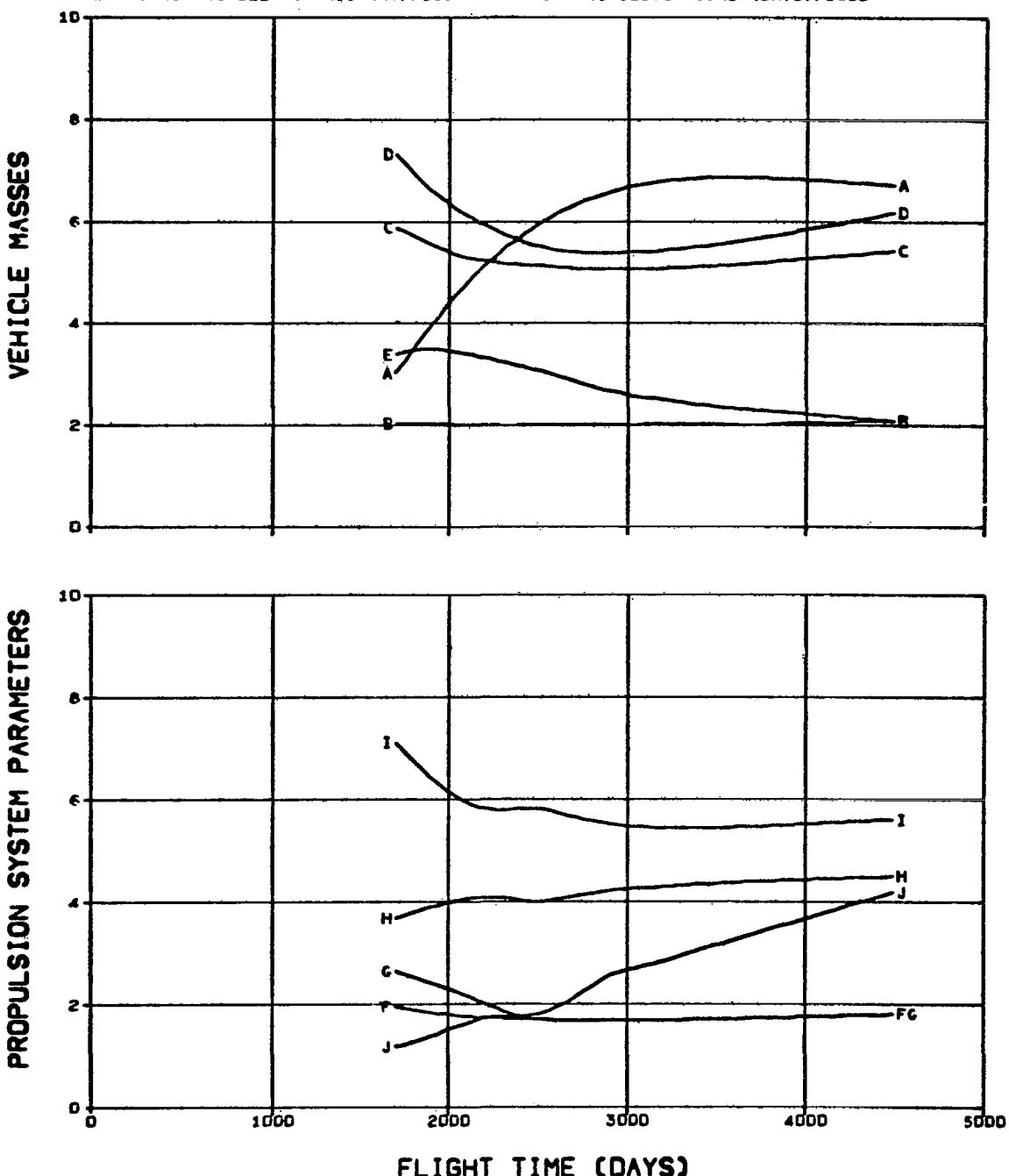


FIG. 6.6.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/50
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 6.6.5 SATURN MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

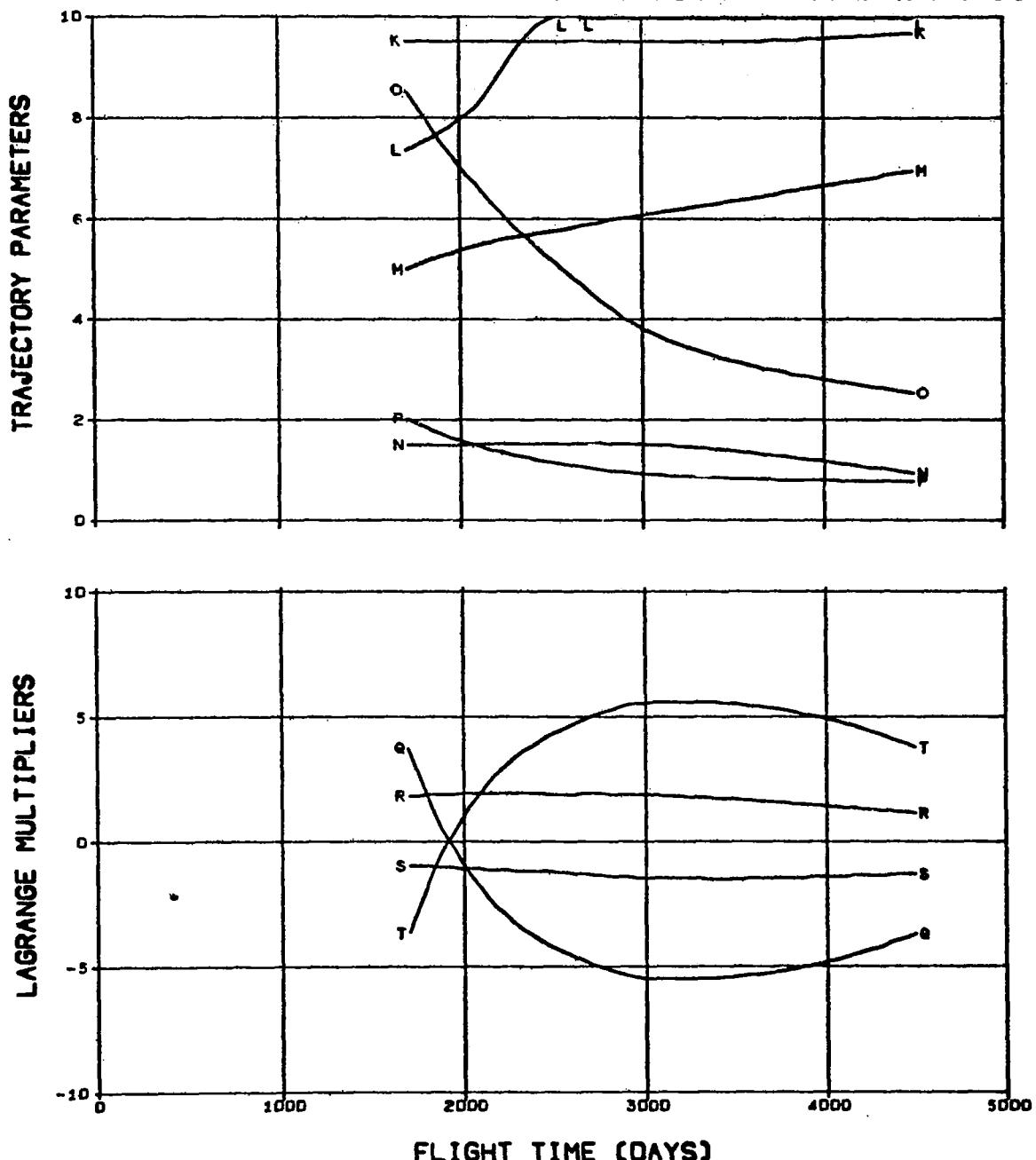
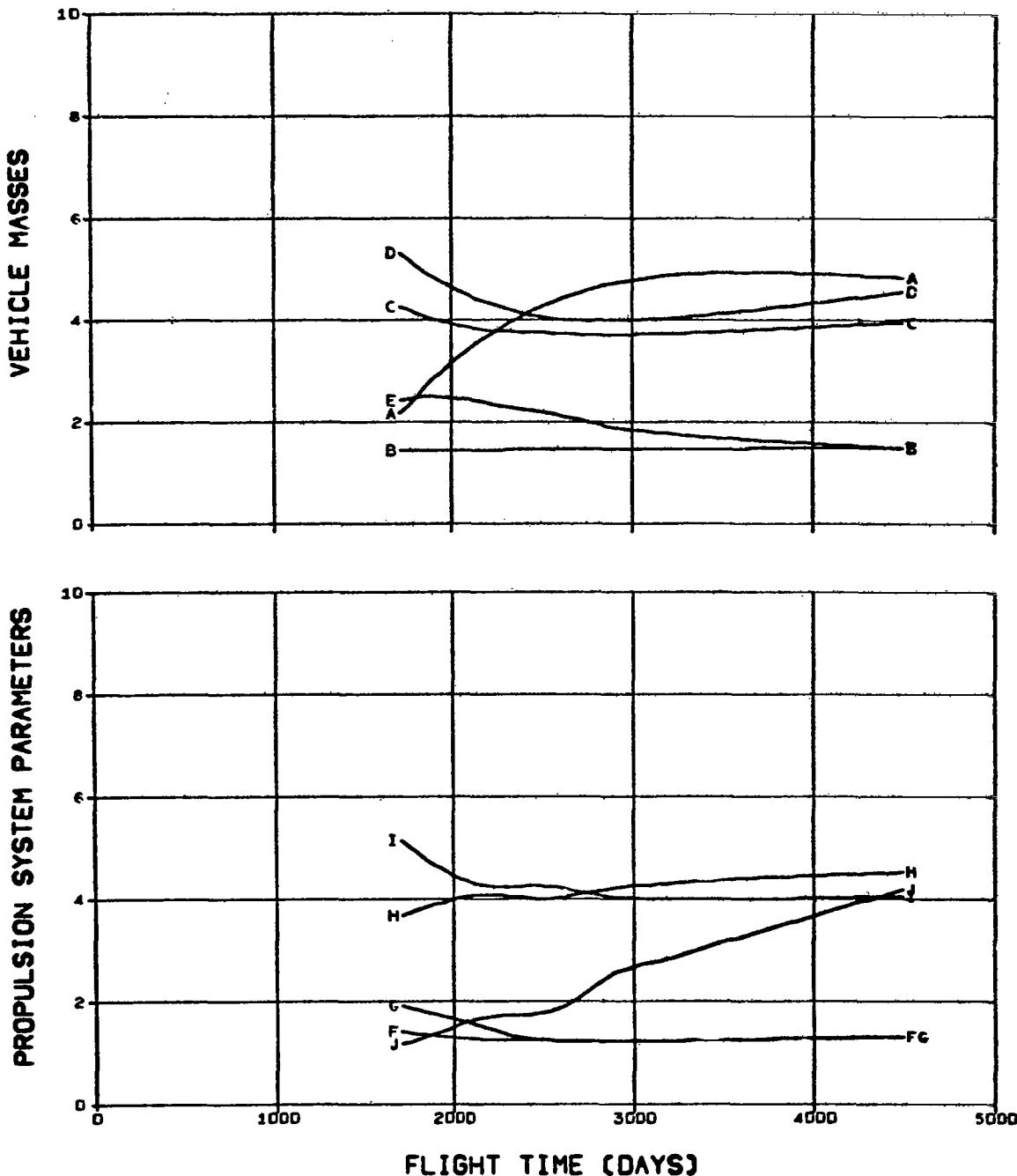


FIG. 6.6.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 6.6.6 SATURN MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU) Q RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-2
 O ARRIVAL EXCESS SPEED (M/SEC)/1000

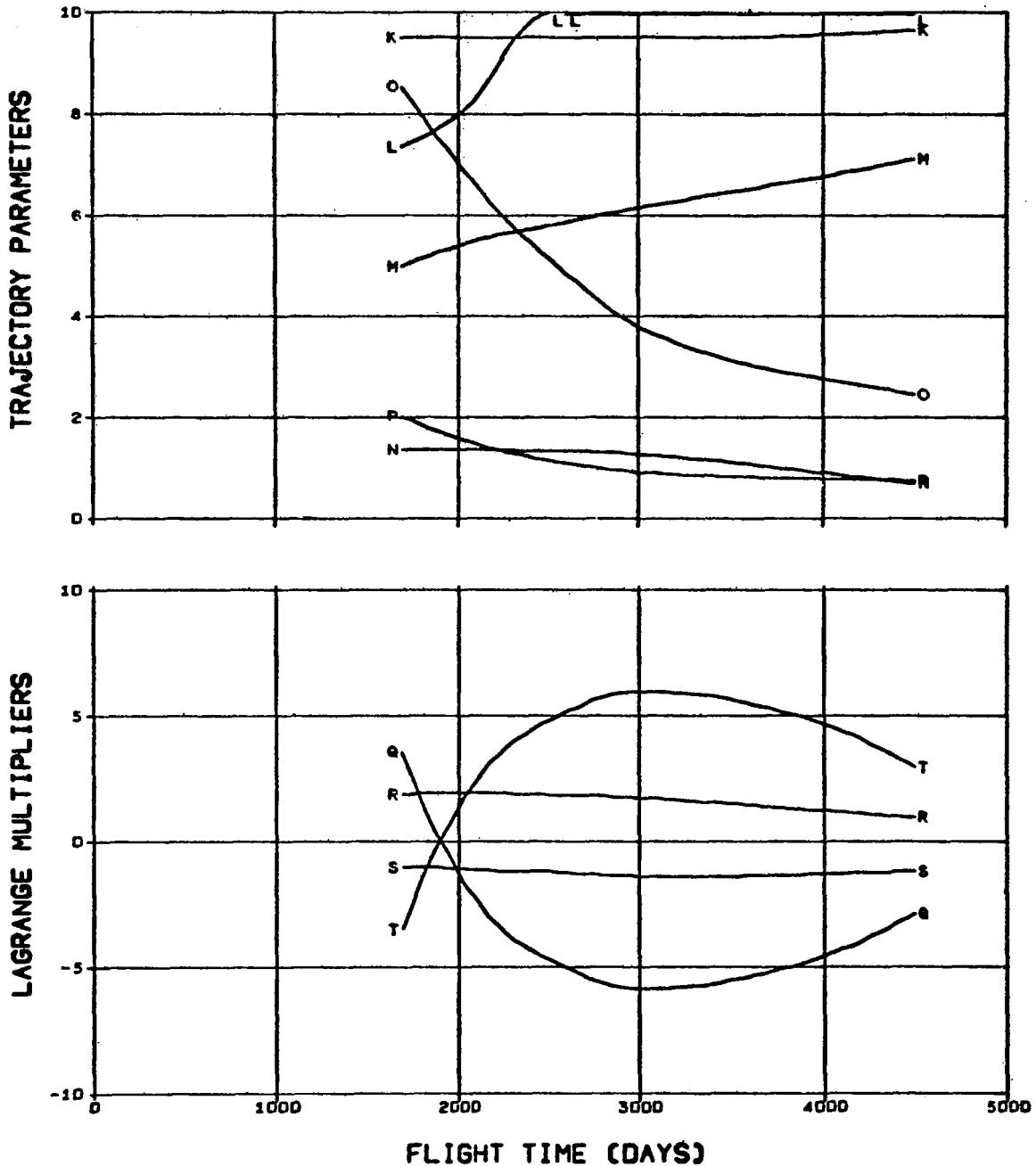


FIG. 6.6.6 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/10000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/100
 G MAXIMUM POWER (KW)/100
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/100

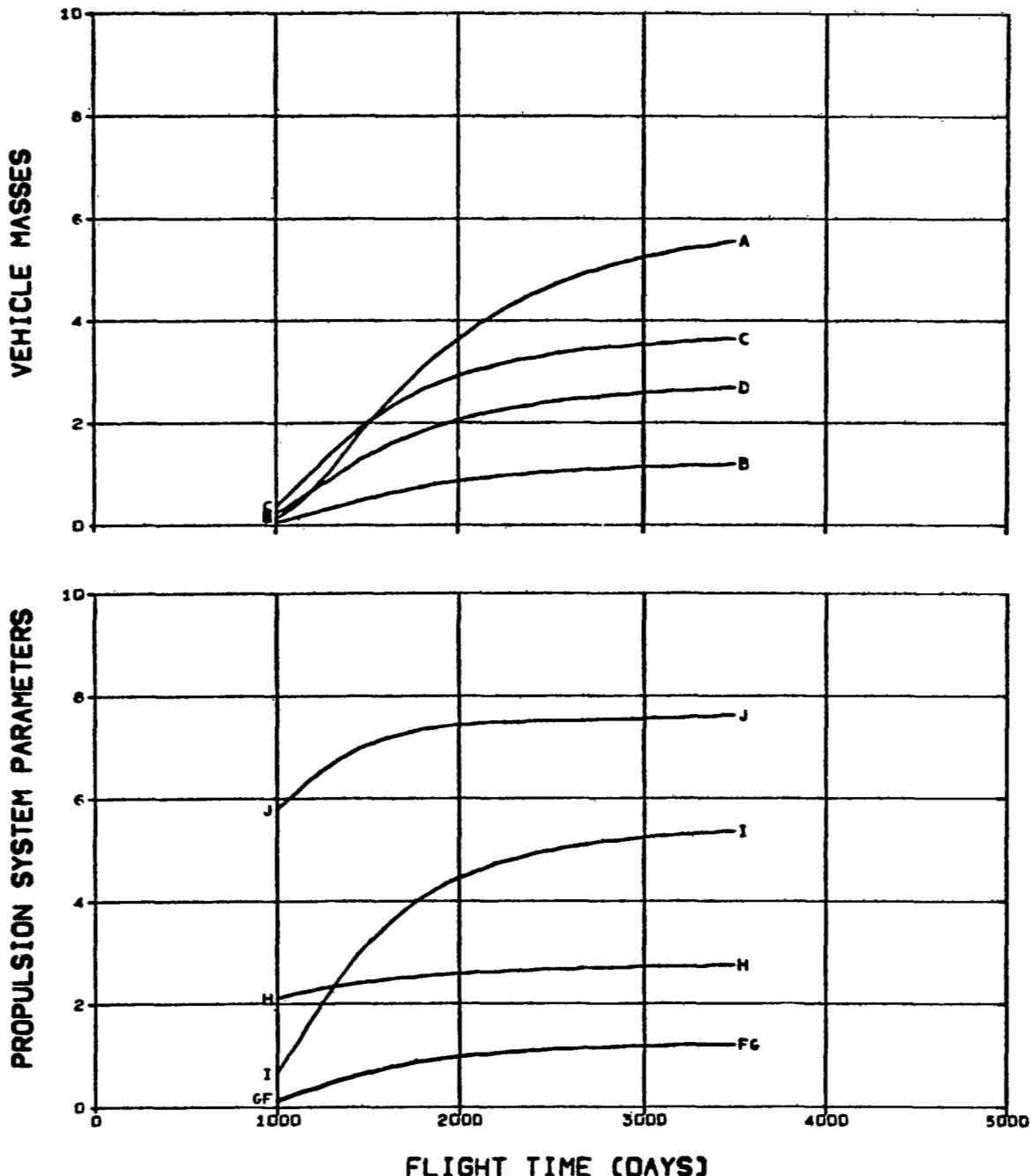


FIG. 7.1.1 URANUS MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

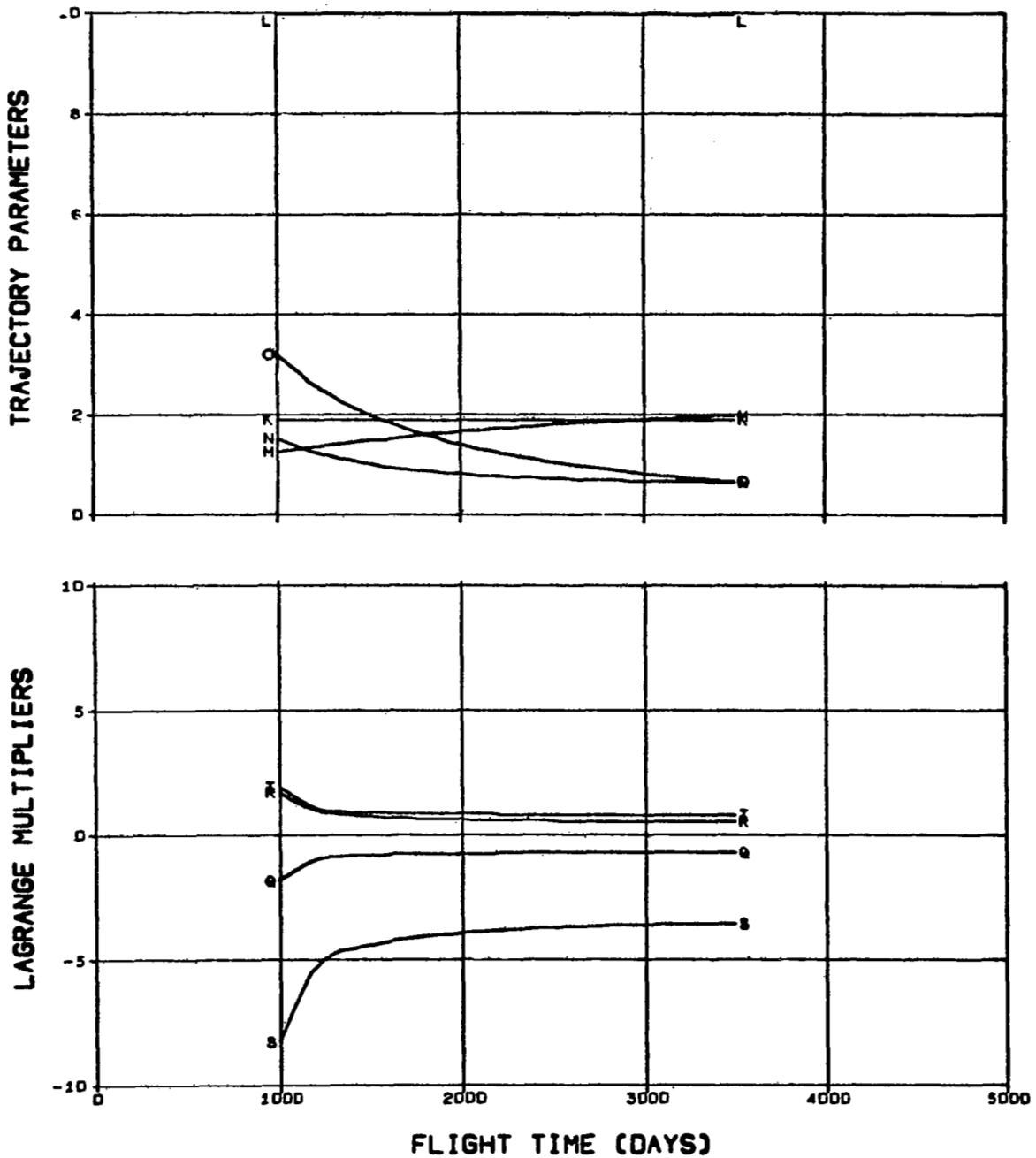


FIG. 7.1.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

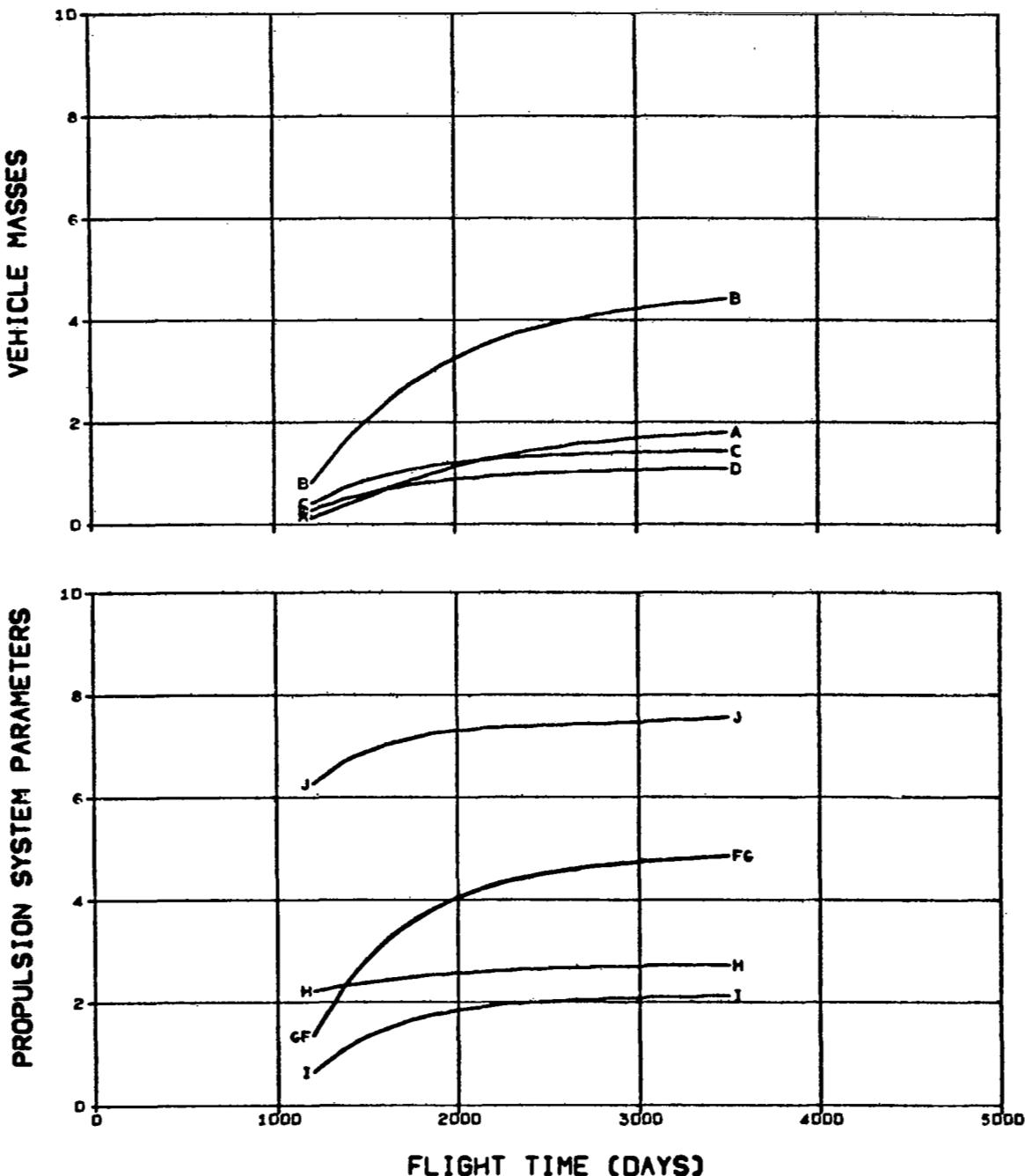


FIG. 7.1.2 URANUS MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/10	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER/10
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/100000		

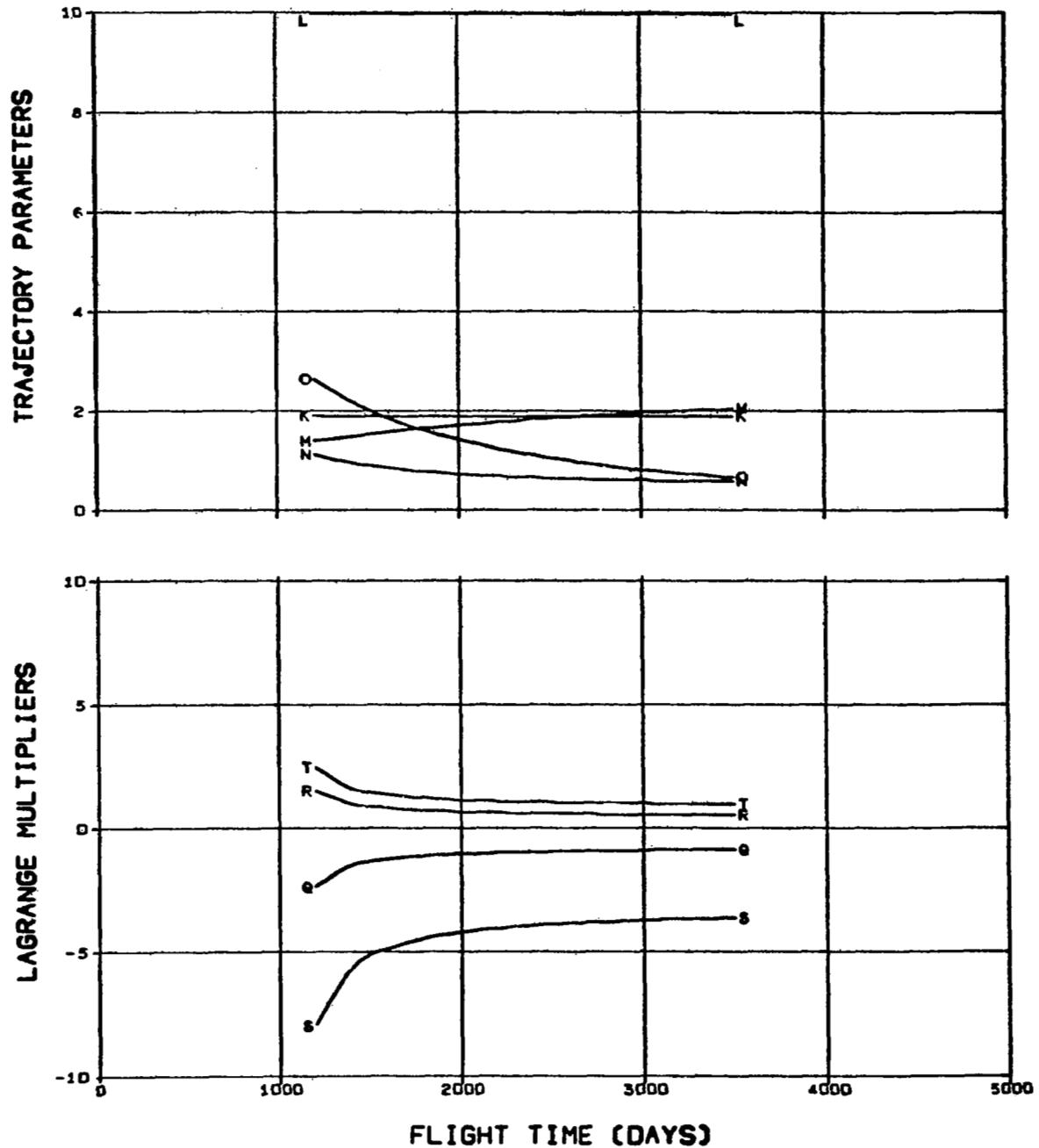


FIG. 7.1.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/100

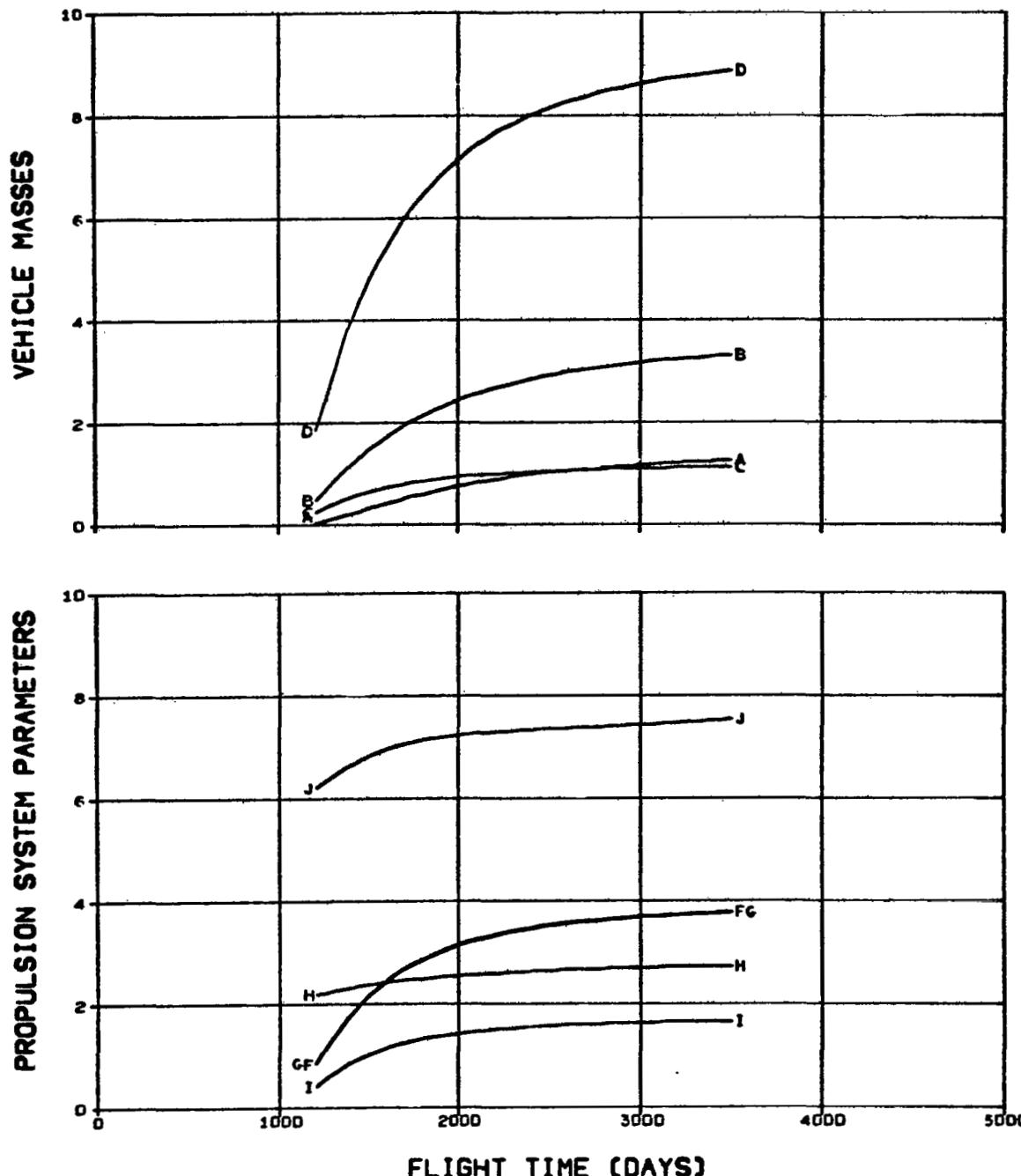


FIG. 7.1.3 URANUS MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

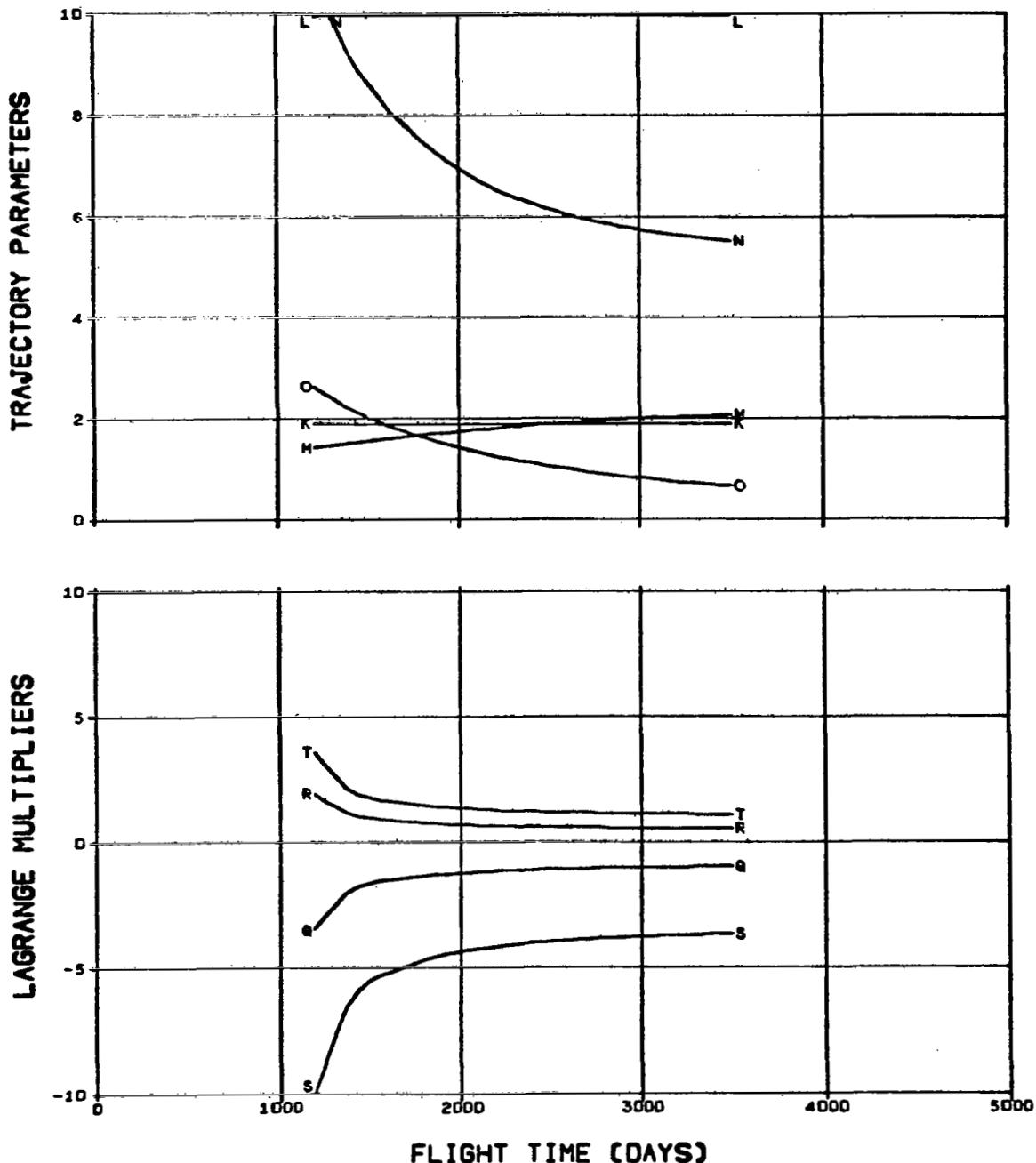


FIG. 7.1.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/100

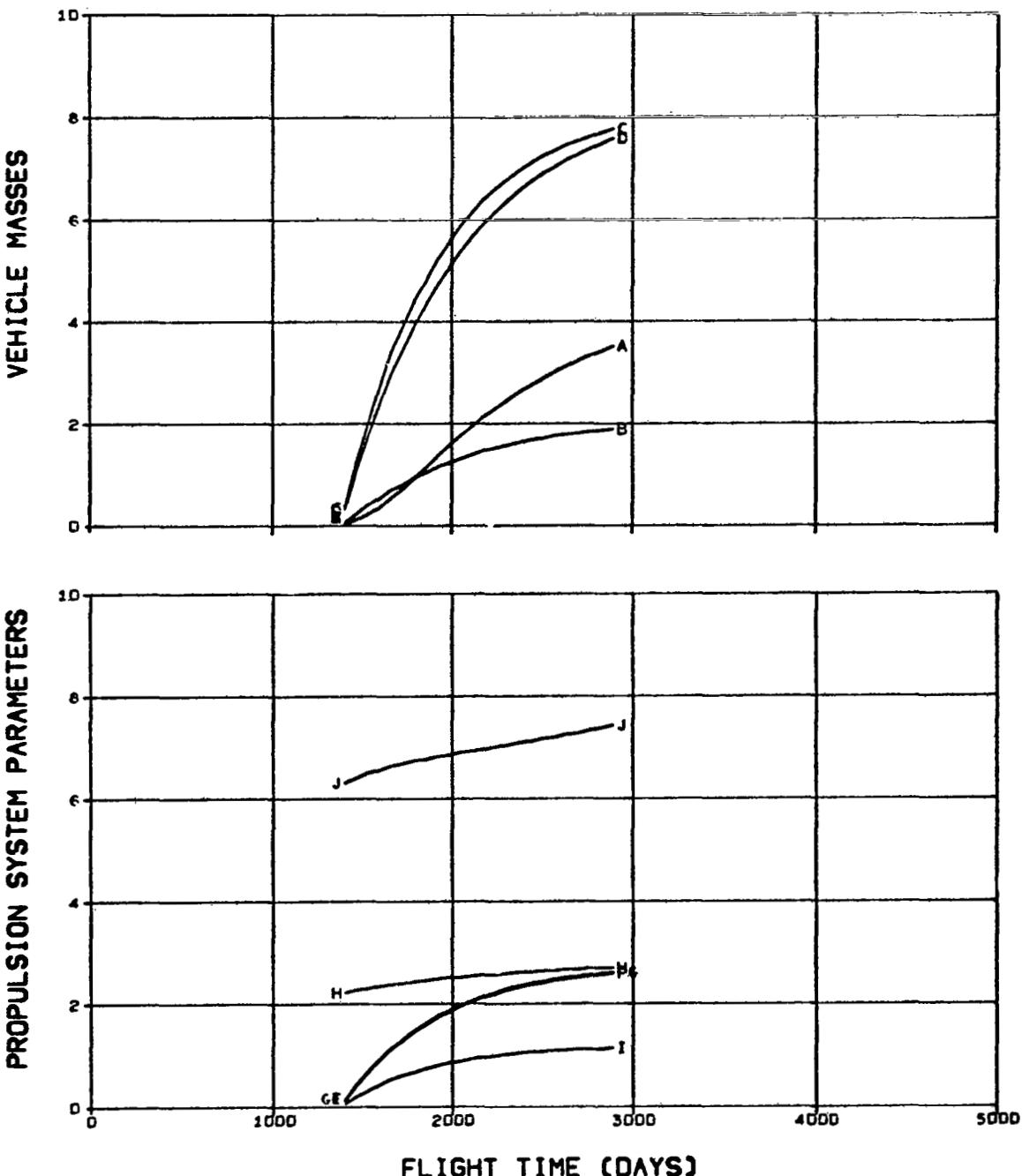


FIG. 7.1.4 URANUS MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0E-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/10
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

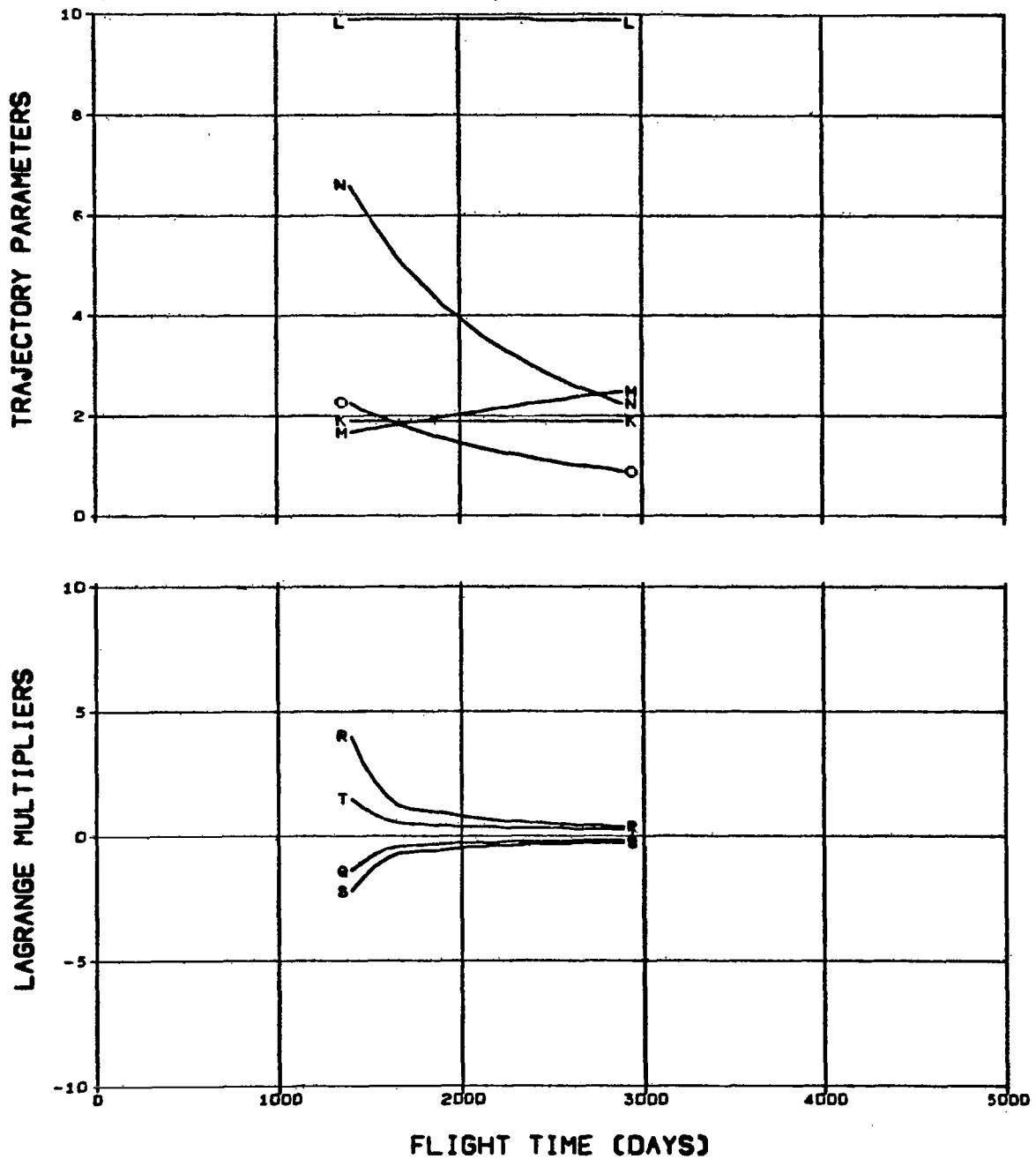


FIG. 7.1.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPULSION TIME (DAYS)/100

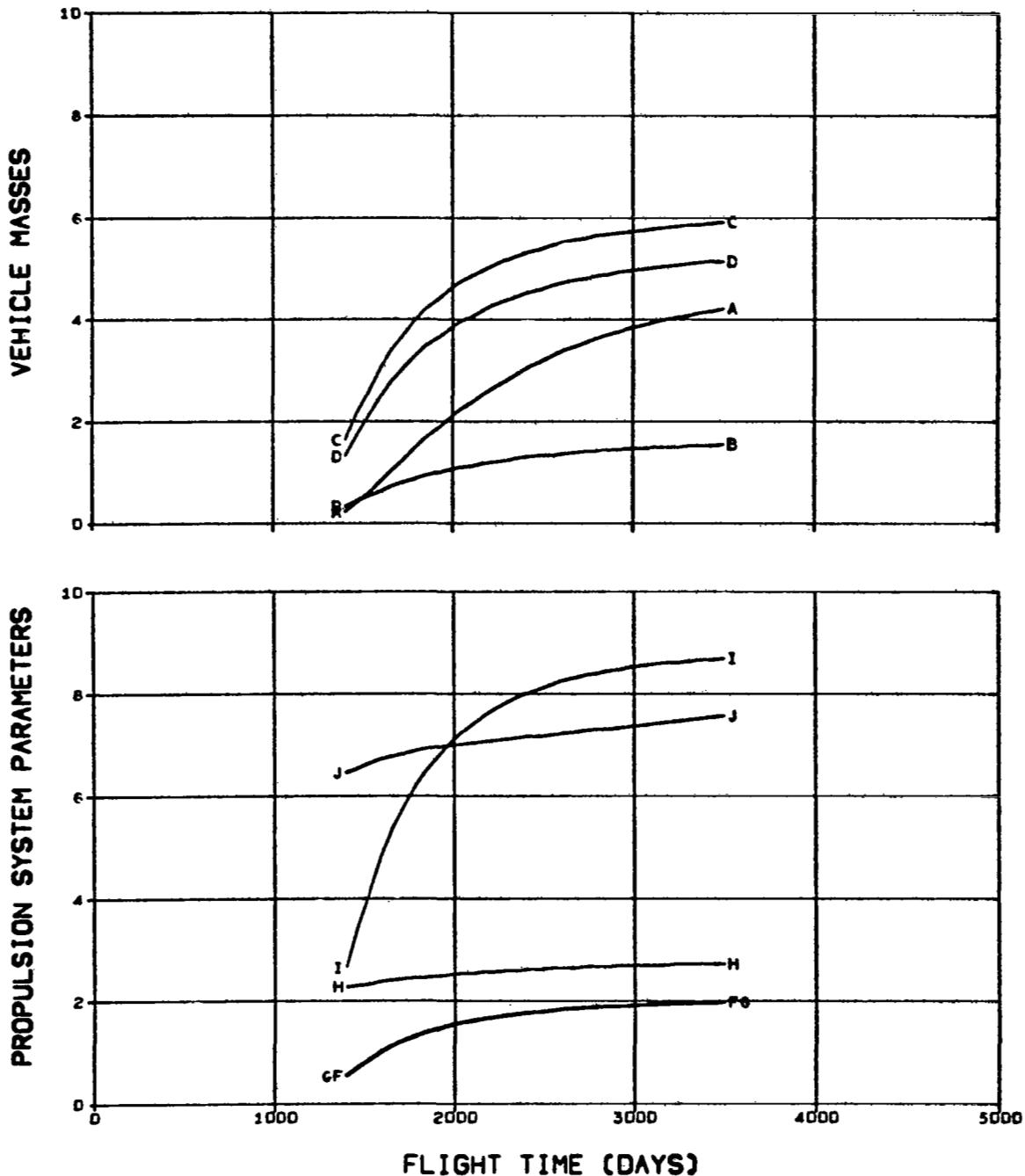


FIG. 7.1.5 URANUS MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

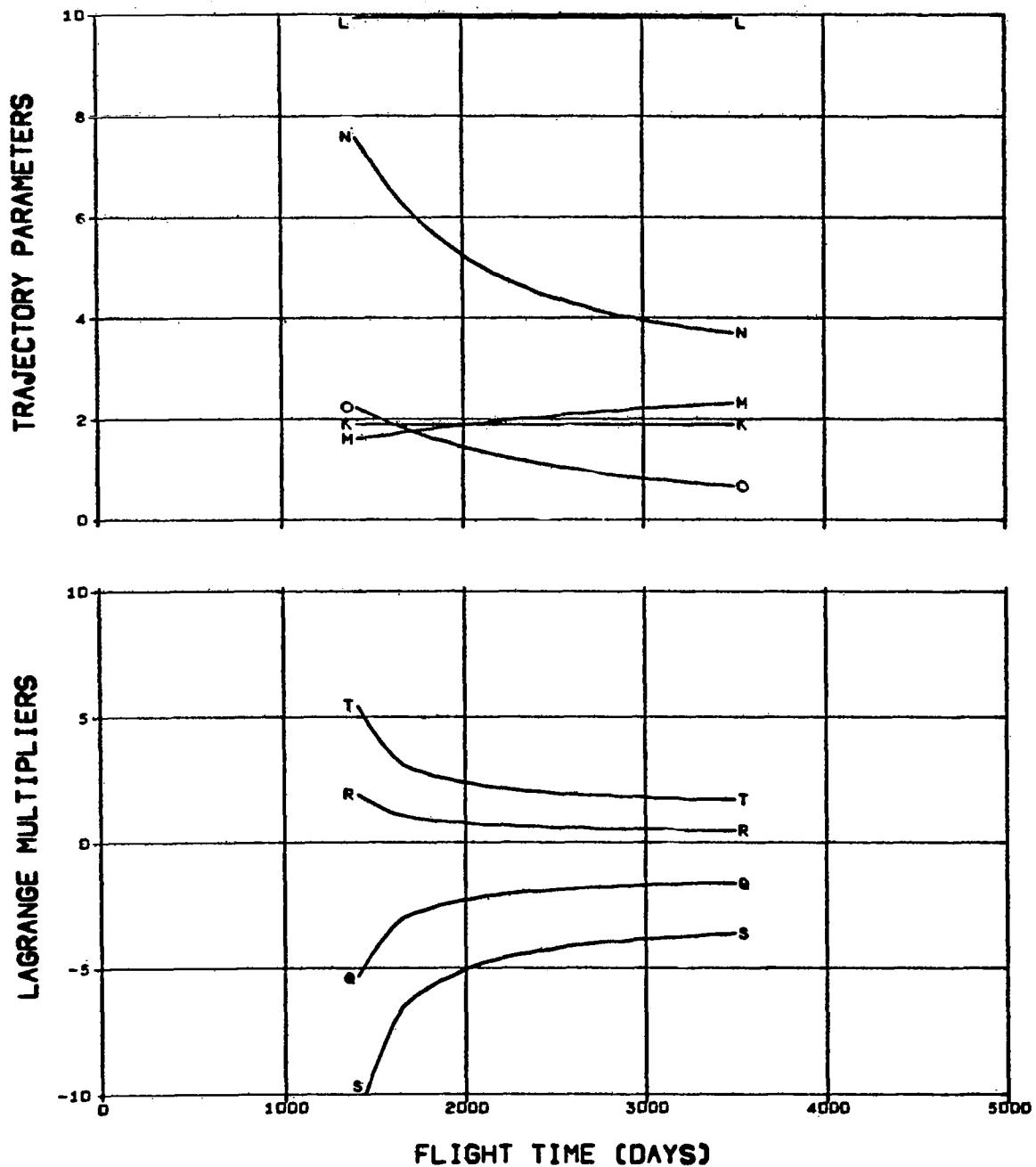


FIG. 7.1.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/100

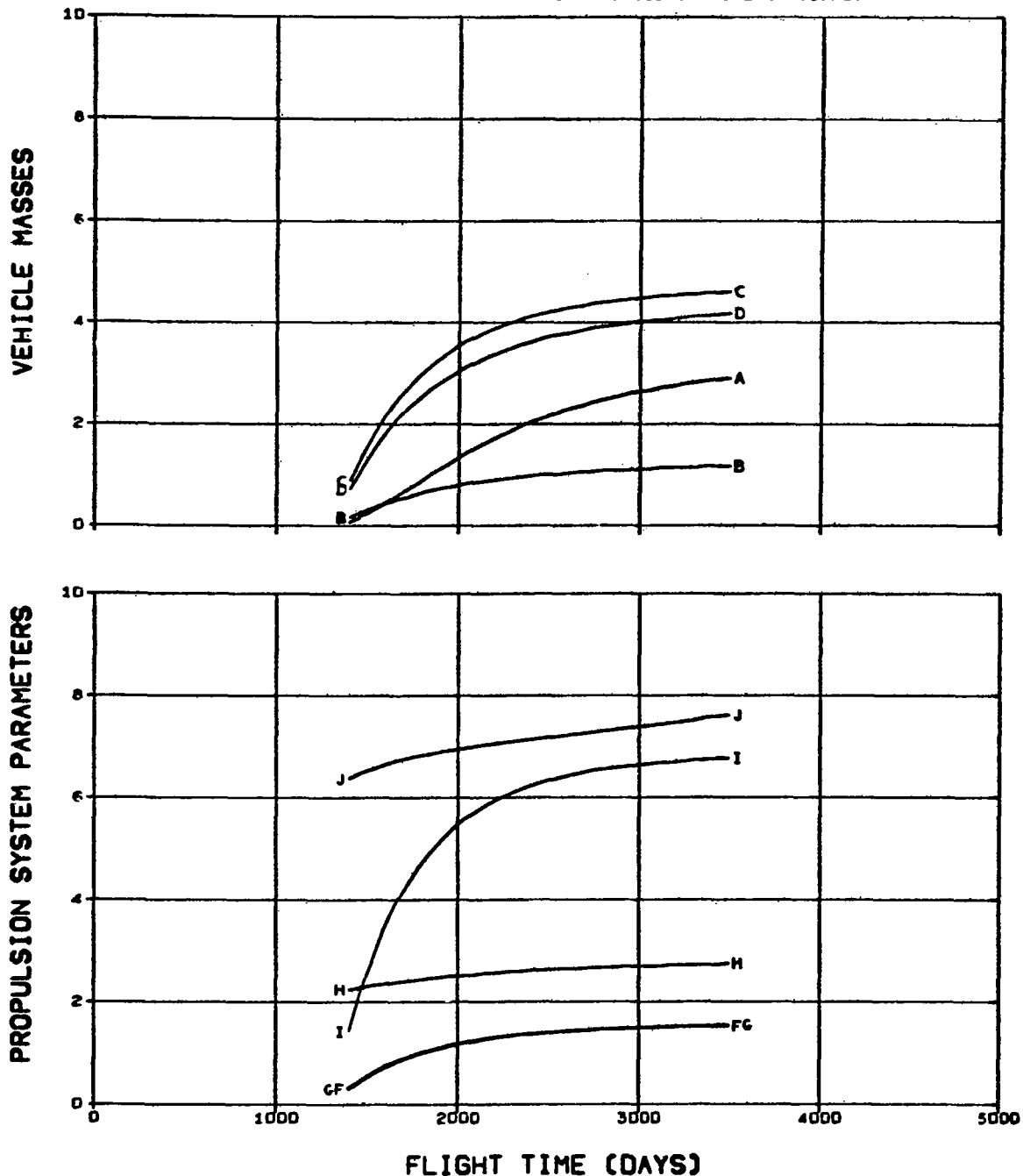


FIG. 7.1.6 URANUS MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/10	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER/10
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

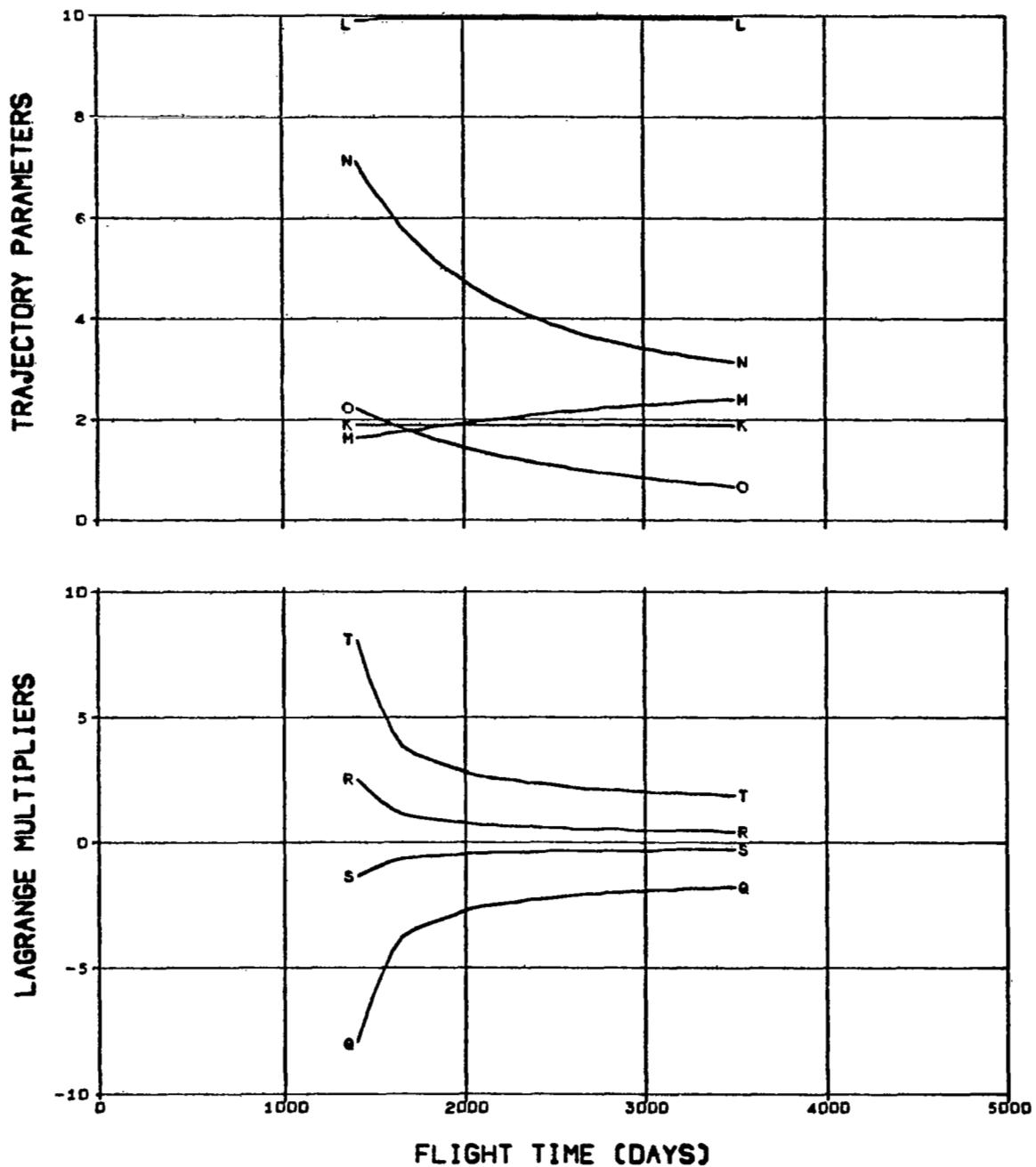


FIG. 7.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/1000

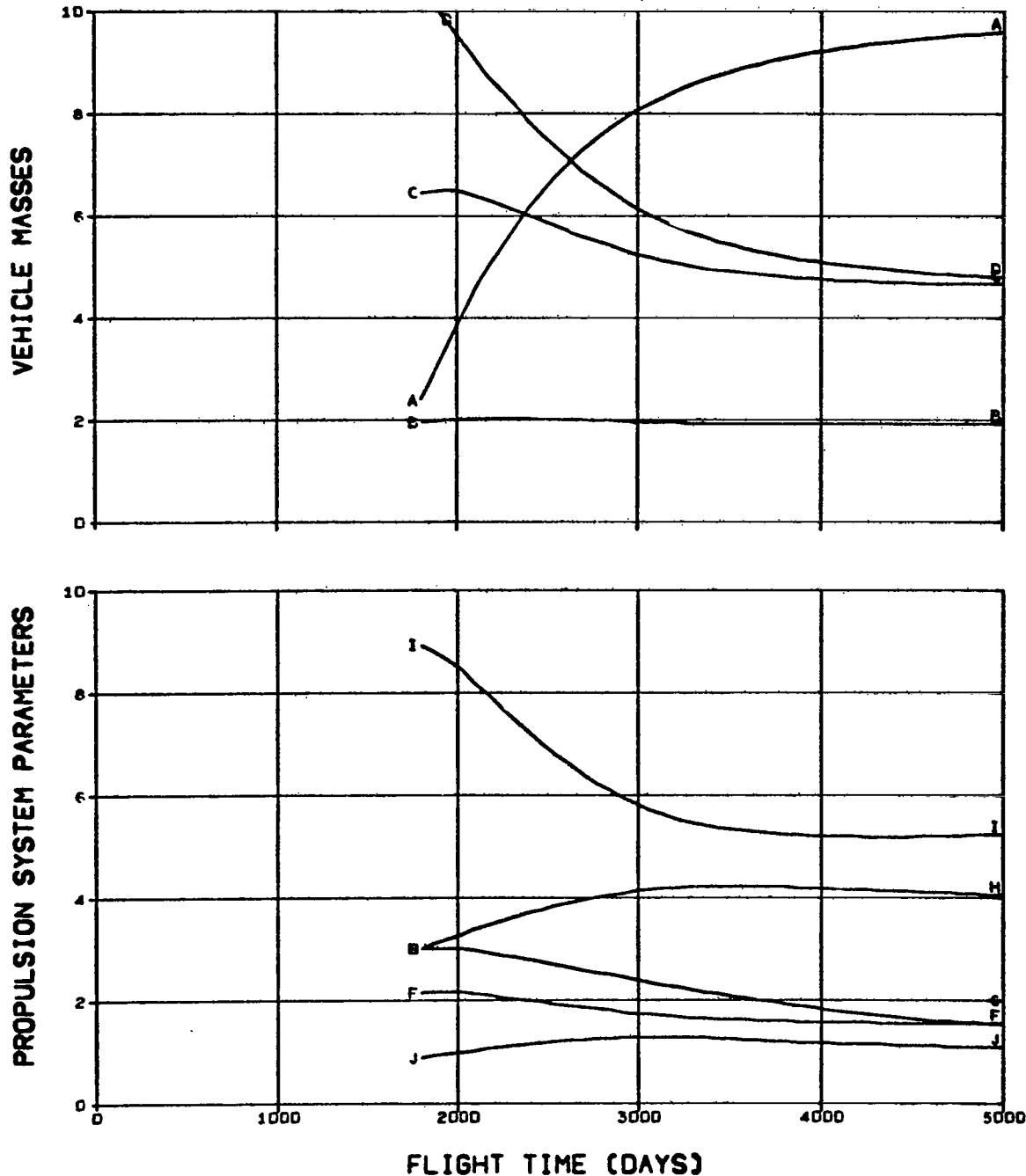


FIG. 7.2.1 URANUS MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/10	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

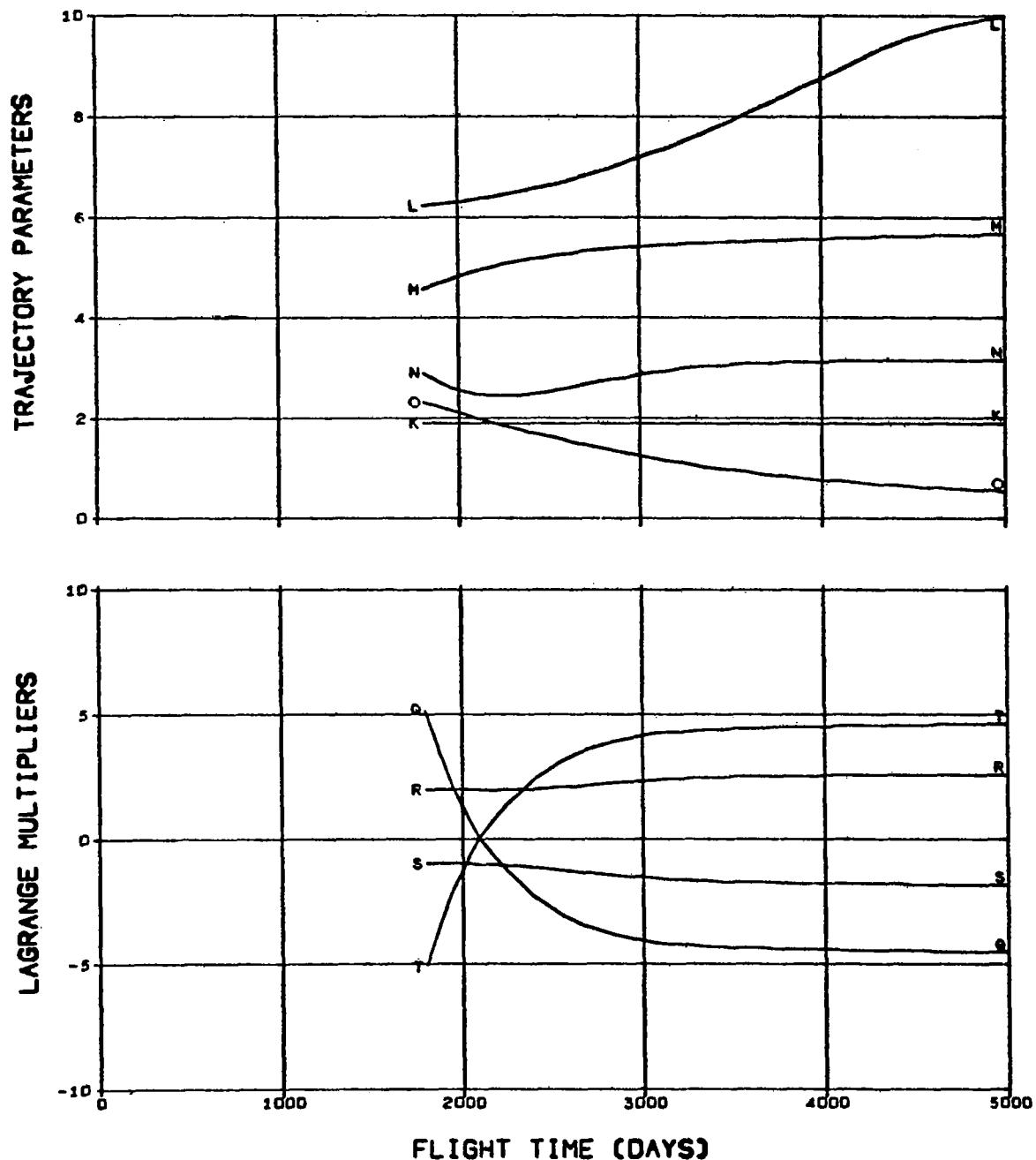


FIG. 7.2.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/1000

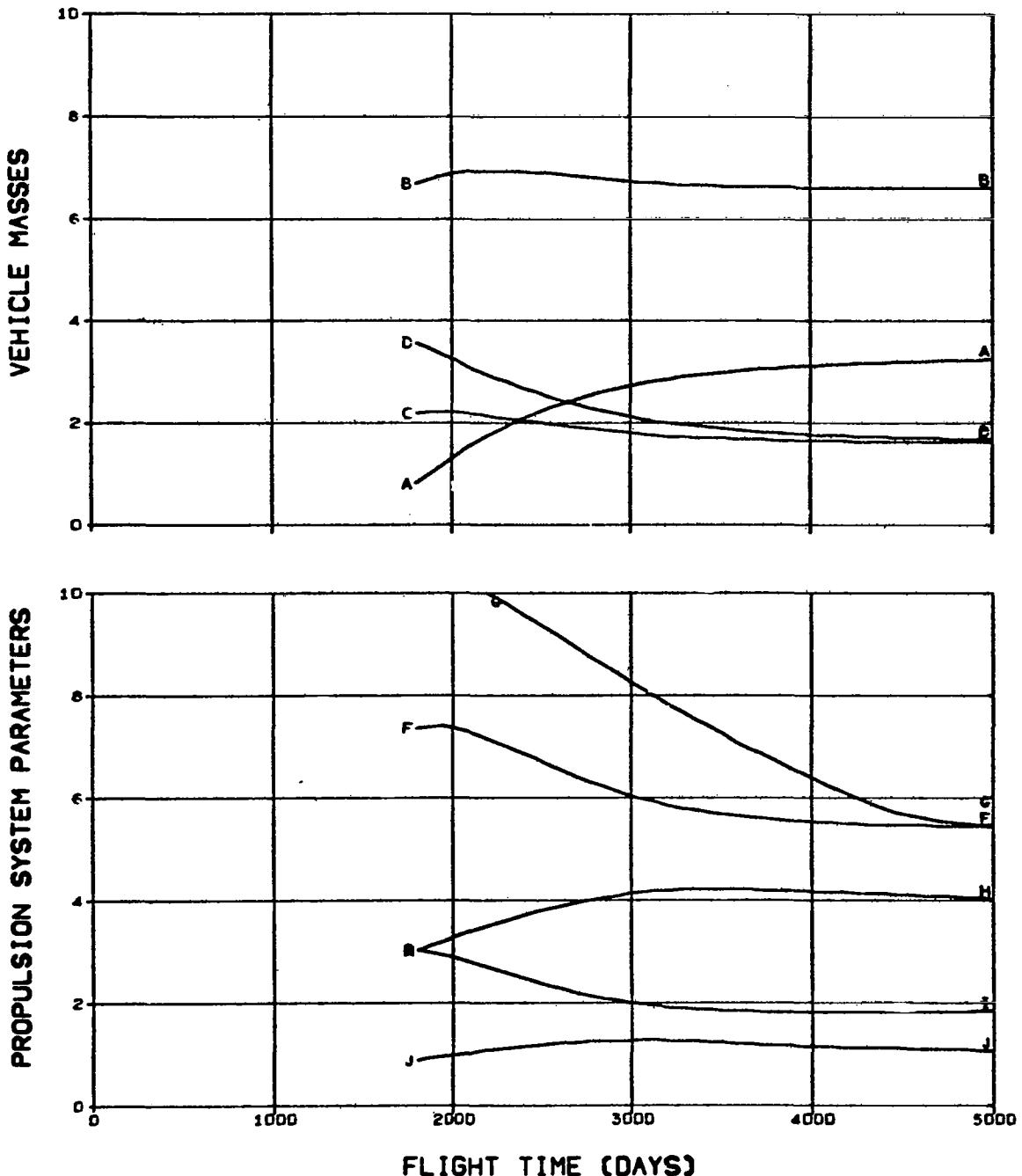


FIG. 7.2.2 URANUS MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

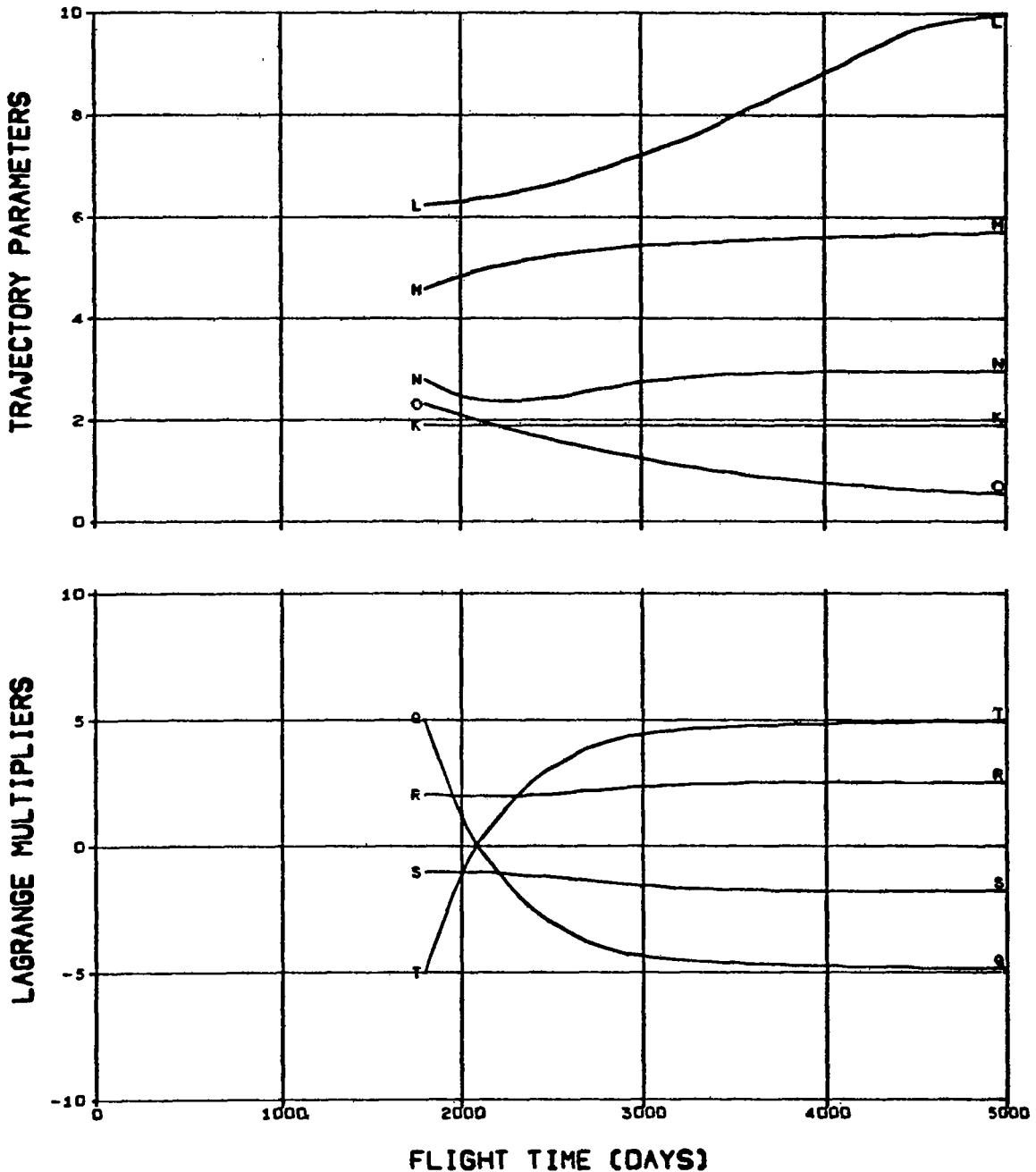


FIG. 7.2.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/1000

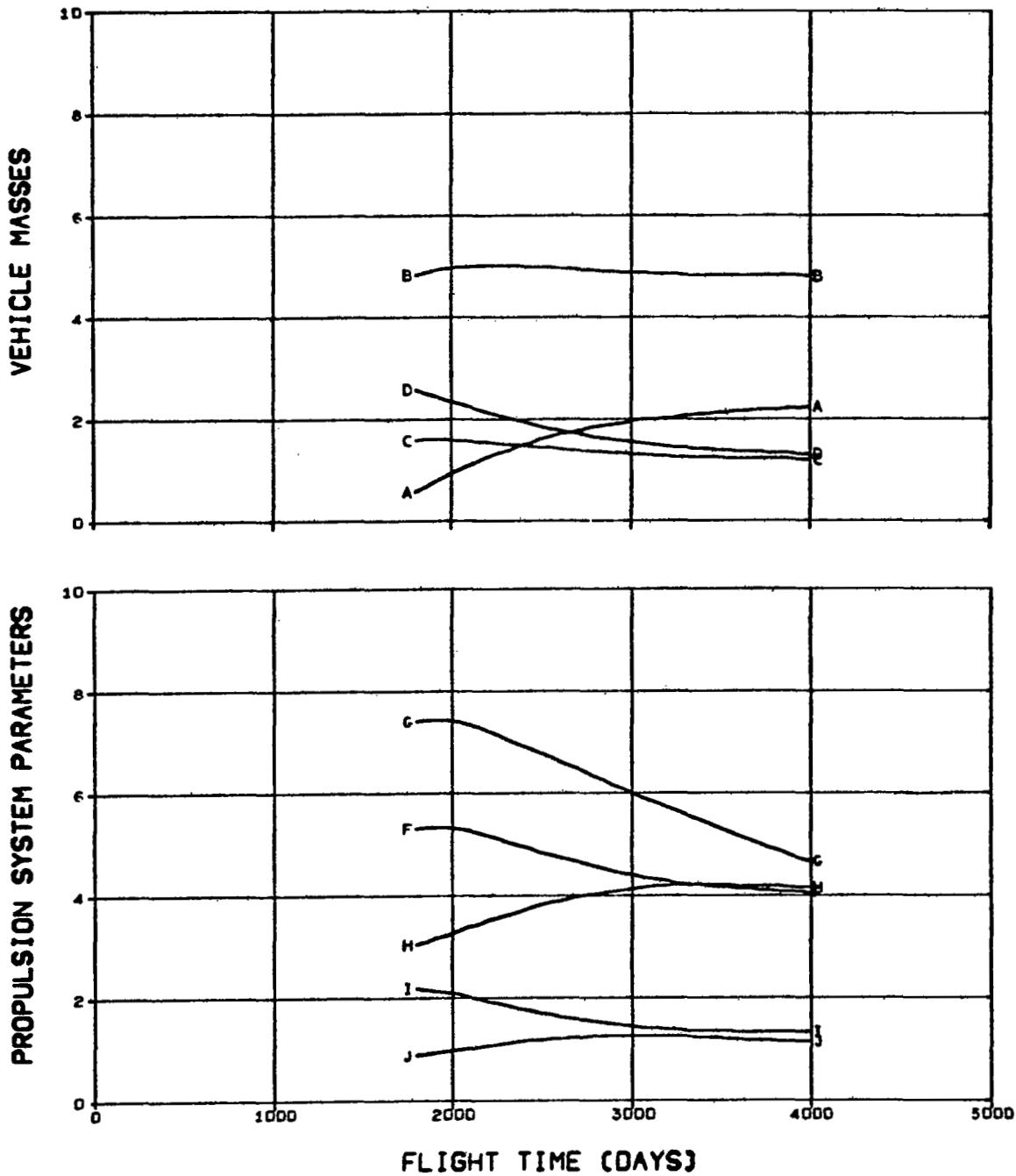


FIG. 7.2.3 URANUS MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

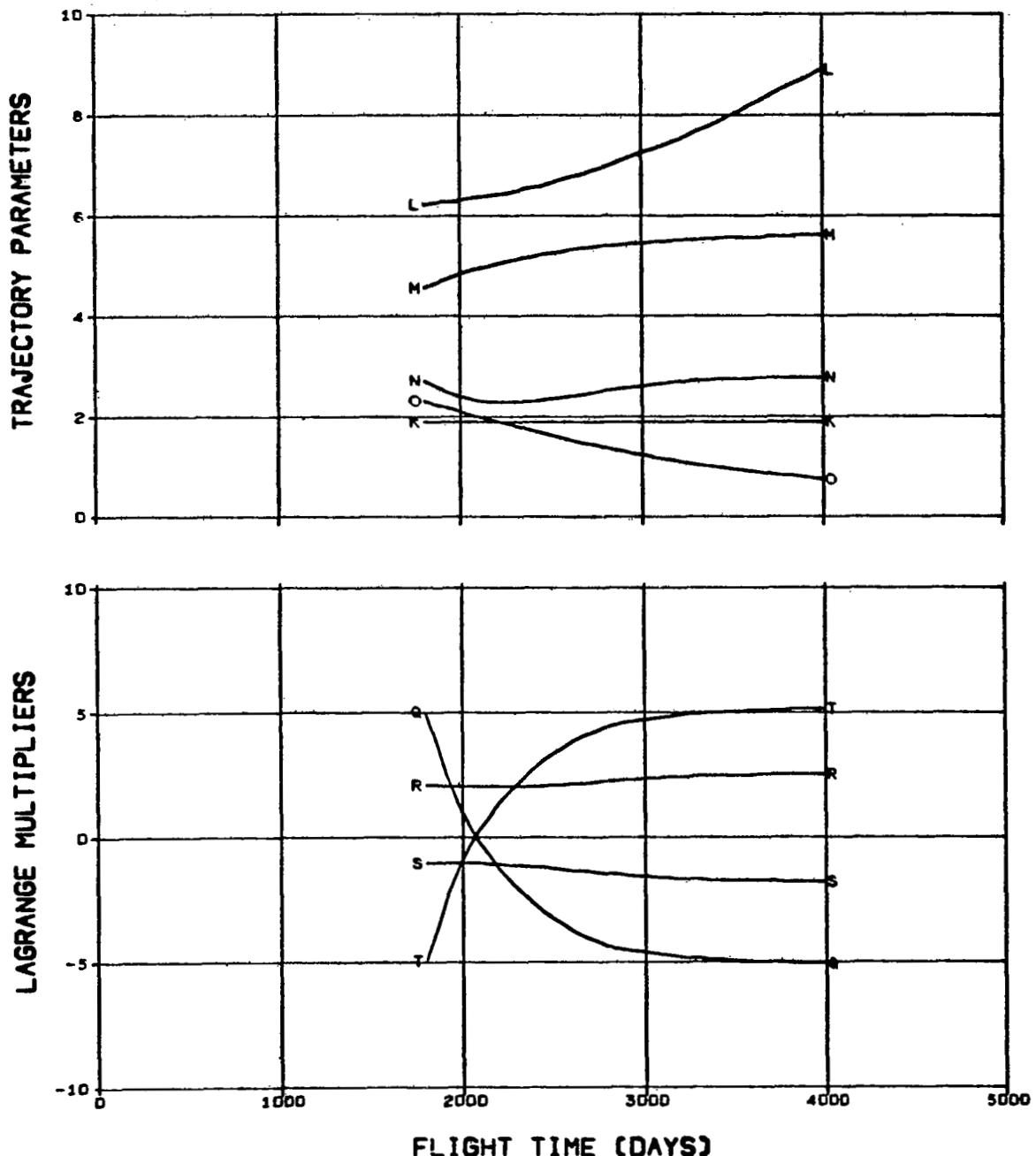


FIG. 7.2.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/1000

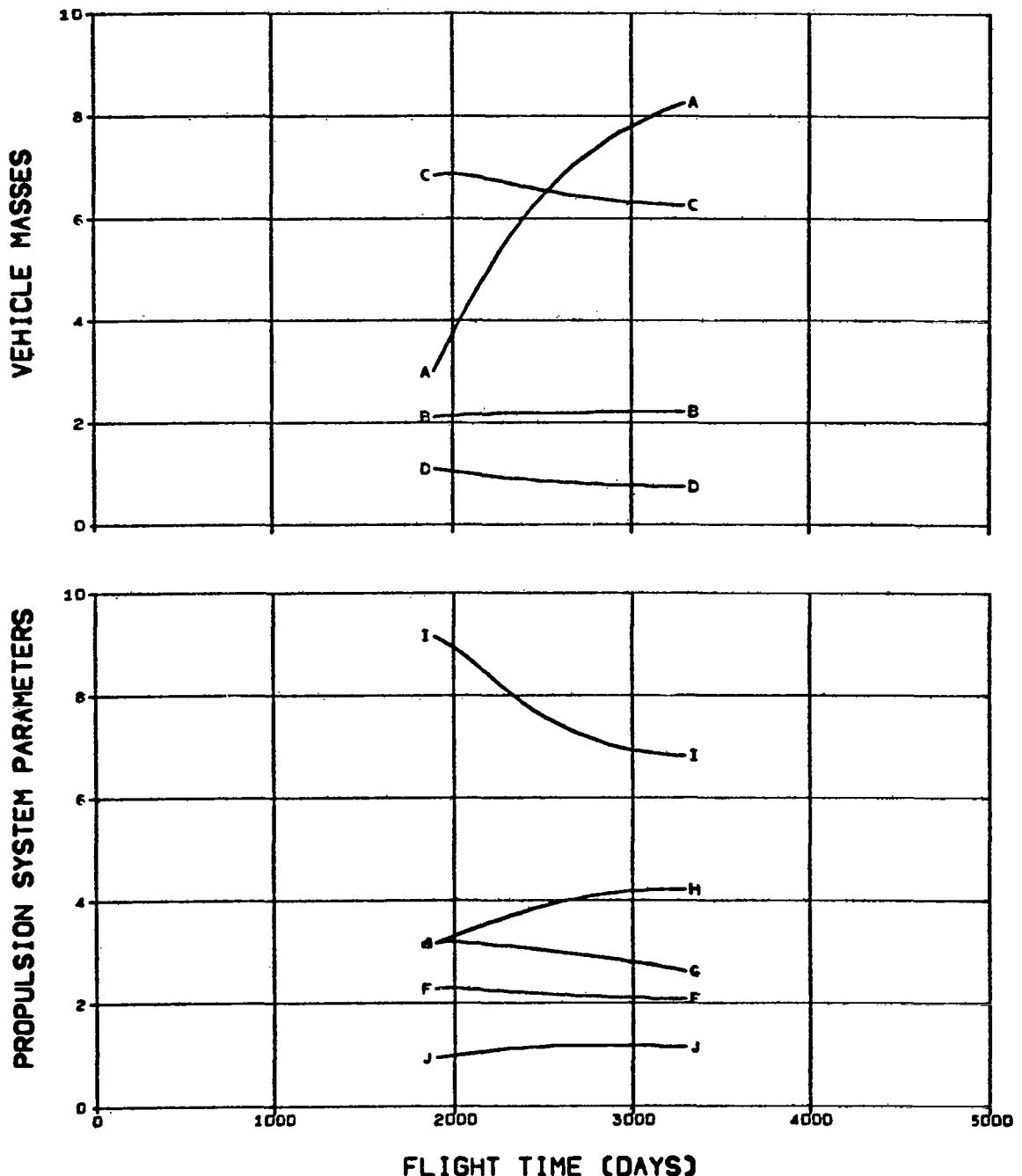


FIG. 7.2.4 URANUS MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.DOE-2
 L MINIMUM SOLAR DISTANCE (AU)/1.DOE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.DOE-2
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

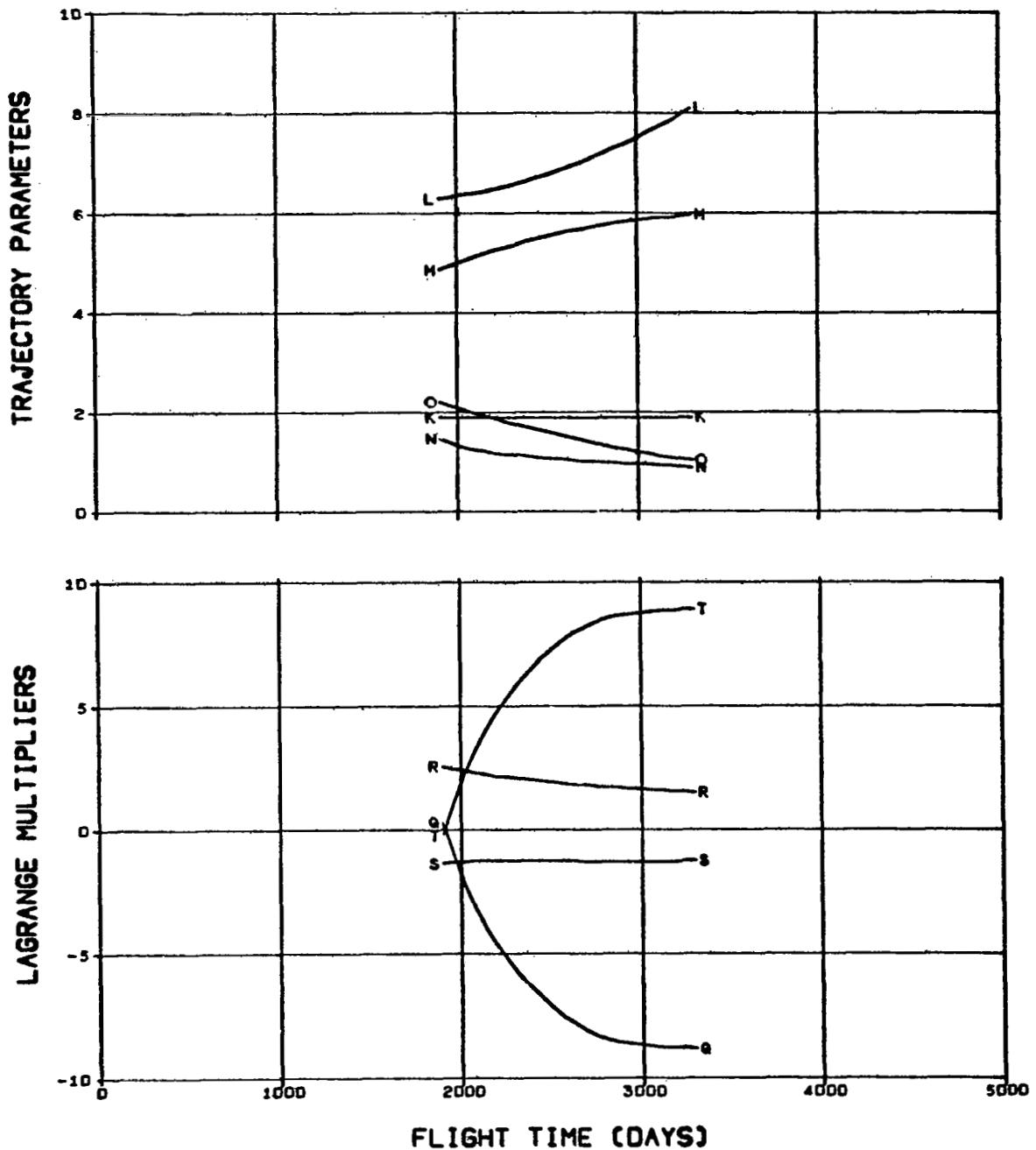


FIG. 7.2.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/1000

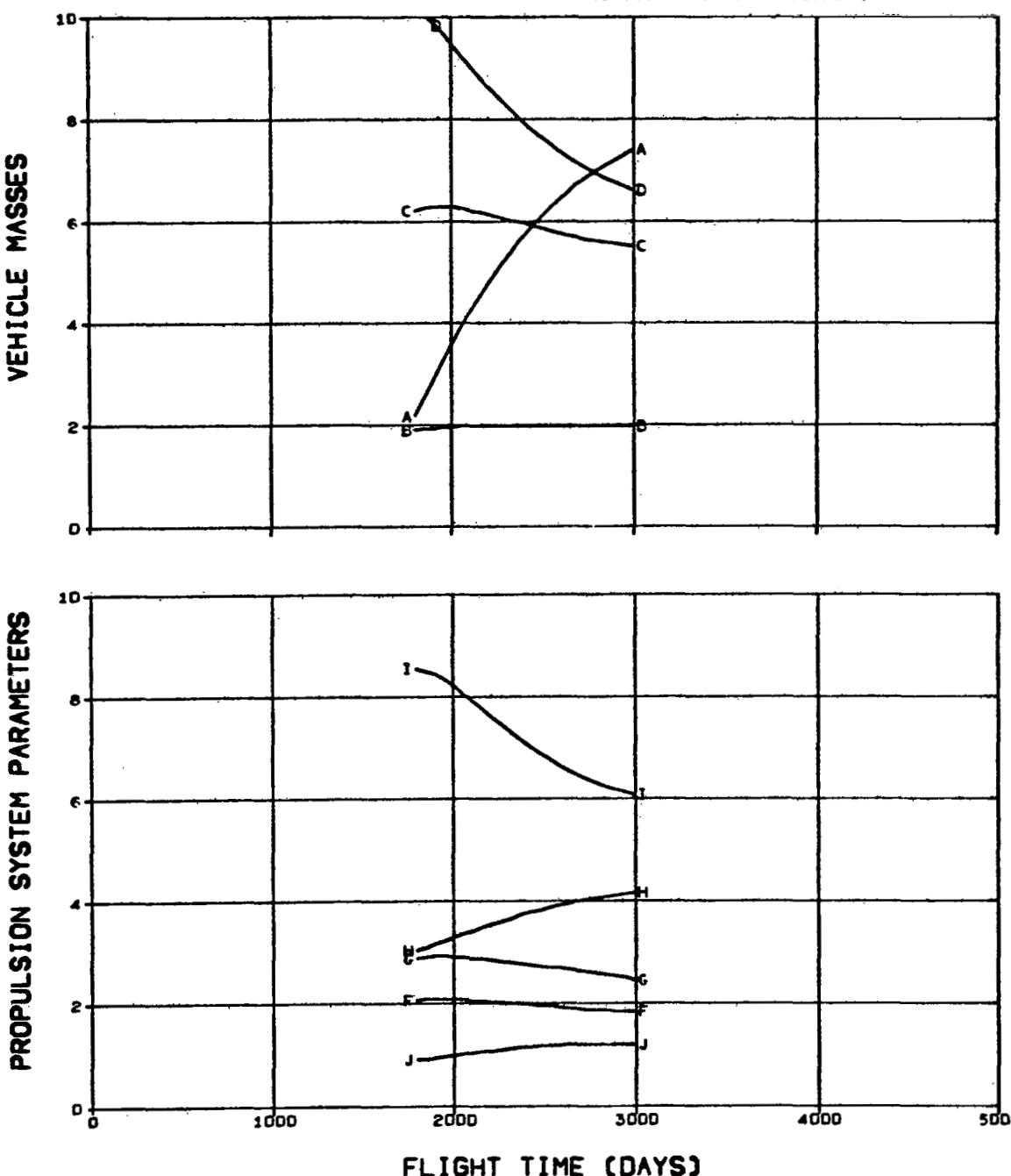


FIG. 7.2.5 URANUS MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 Q X-COMPONENT OF PRIMER/1.0DE-3
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

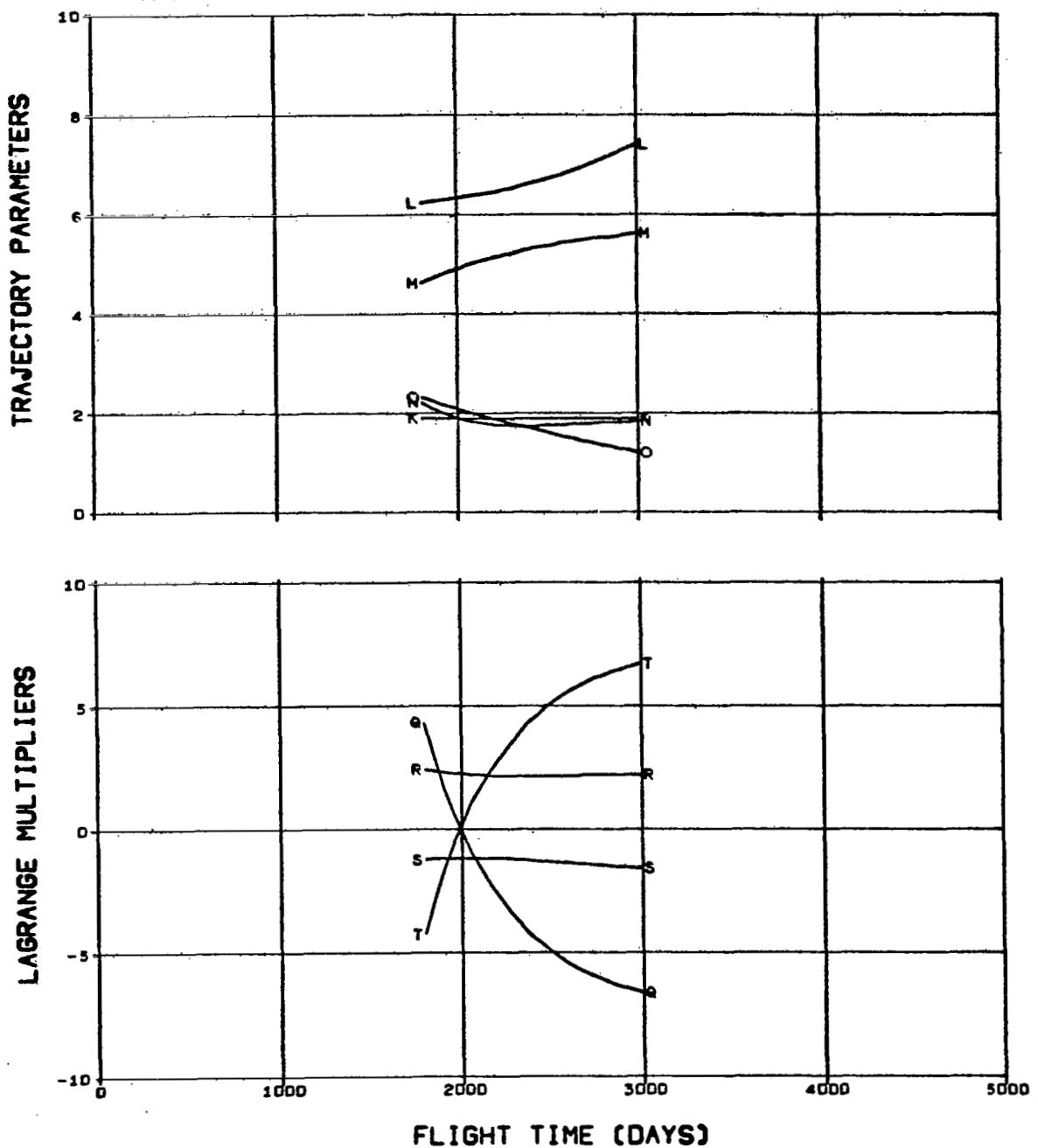


FIG. 7.2.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/1000

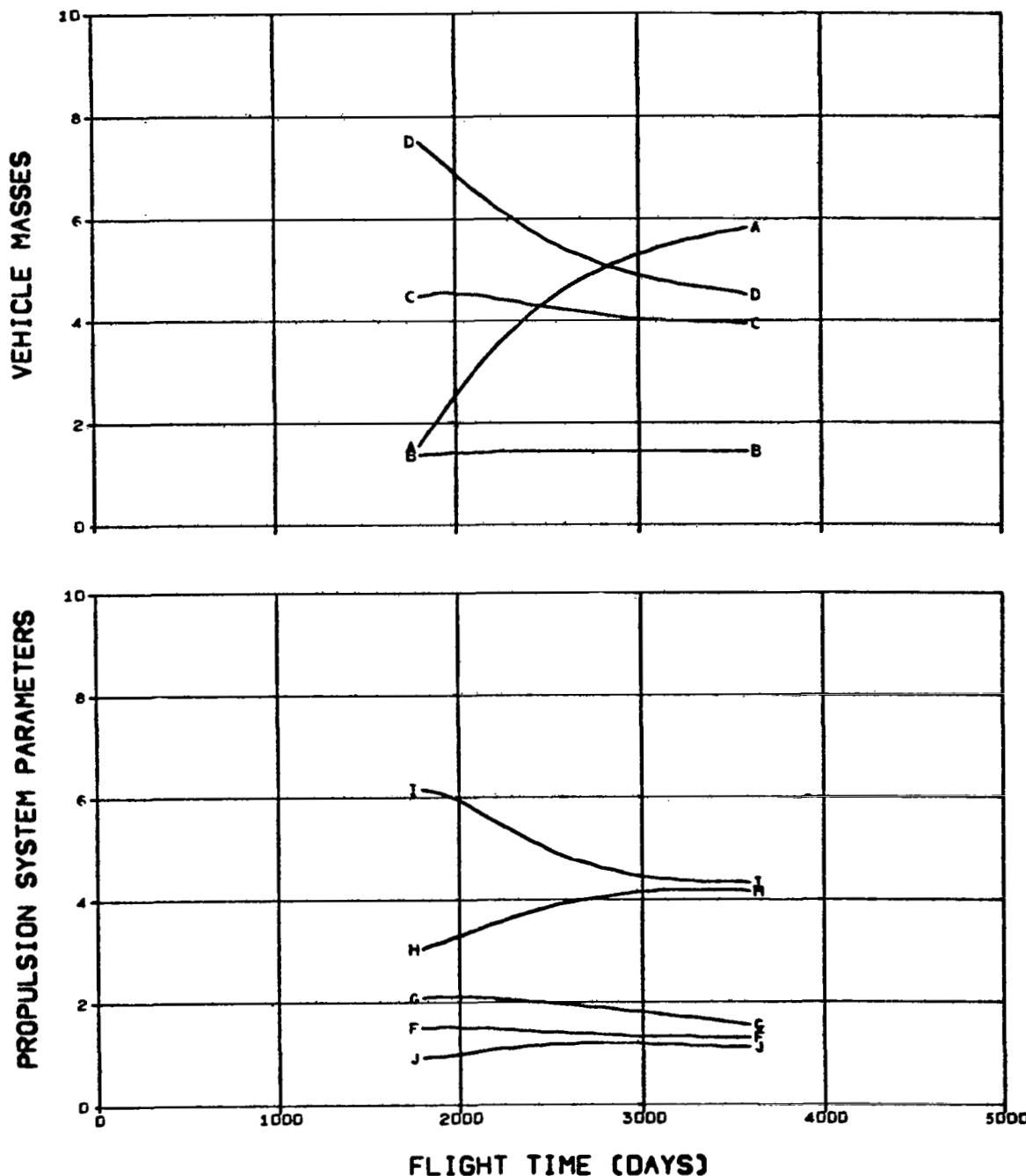


FIG. 7.2.6 URANUS MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/10	Q	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

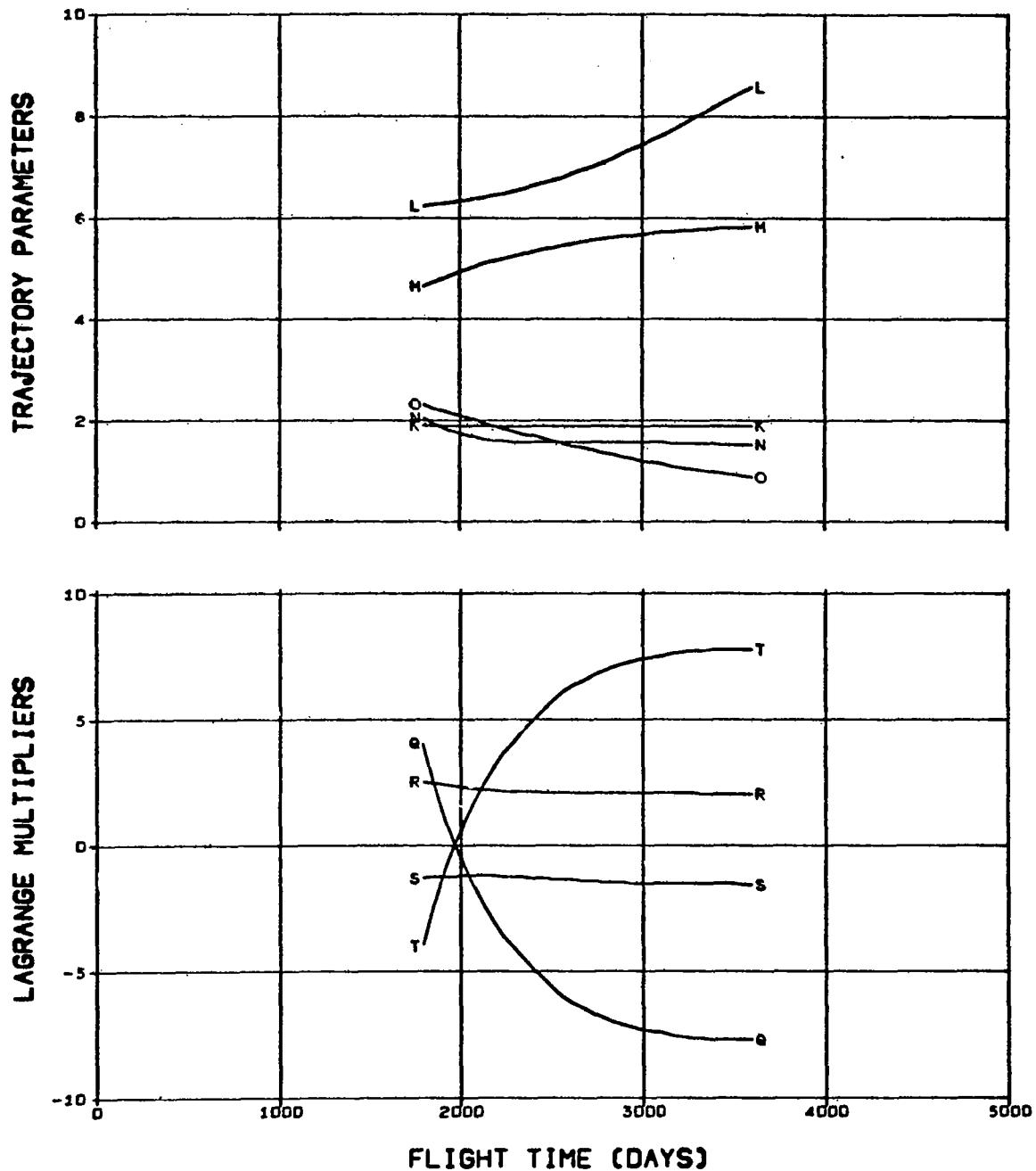


FIG. 7.2.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/1000

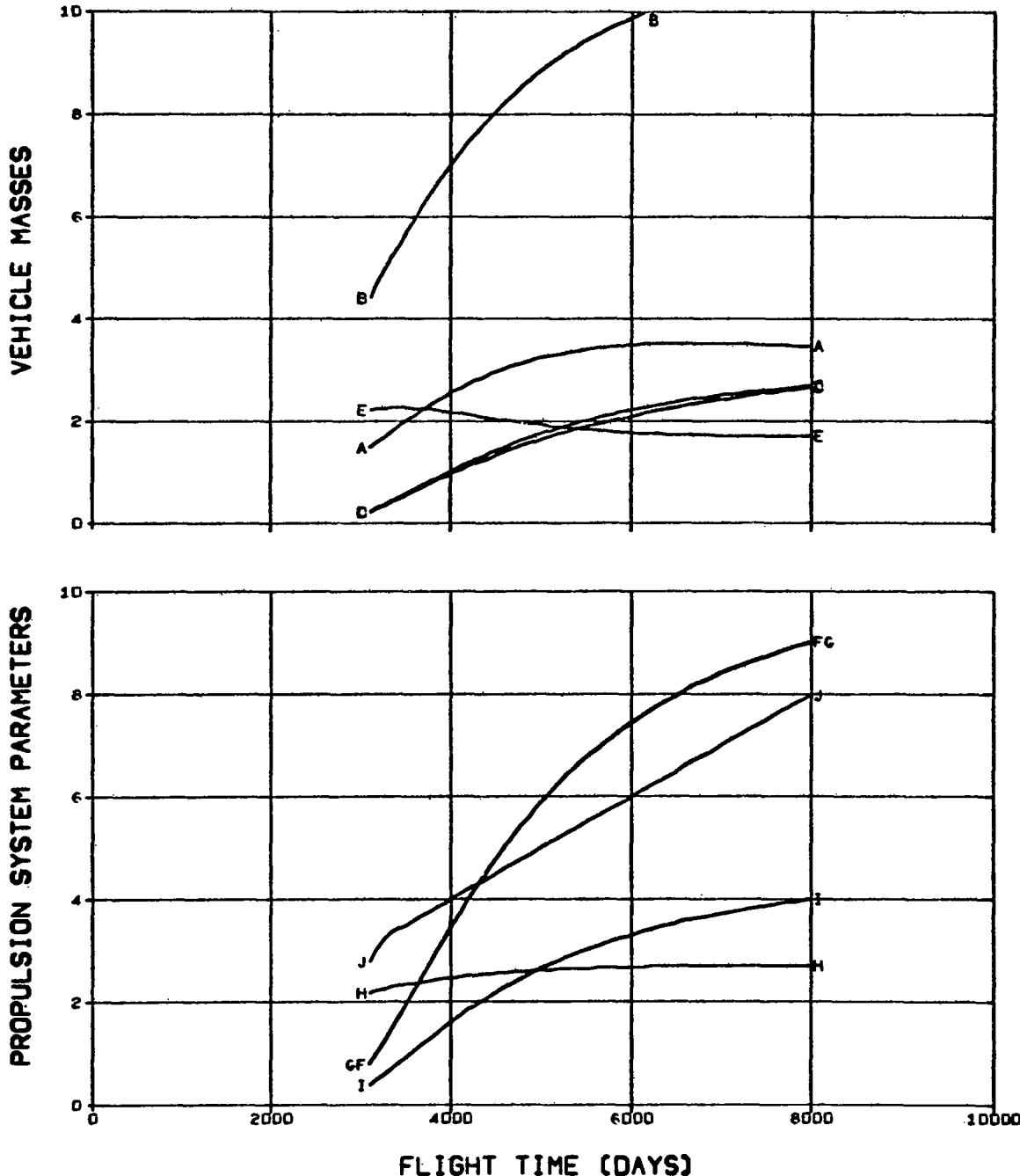


FIG. 7.3.1 URANUS MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/10000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

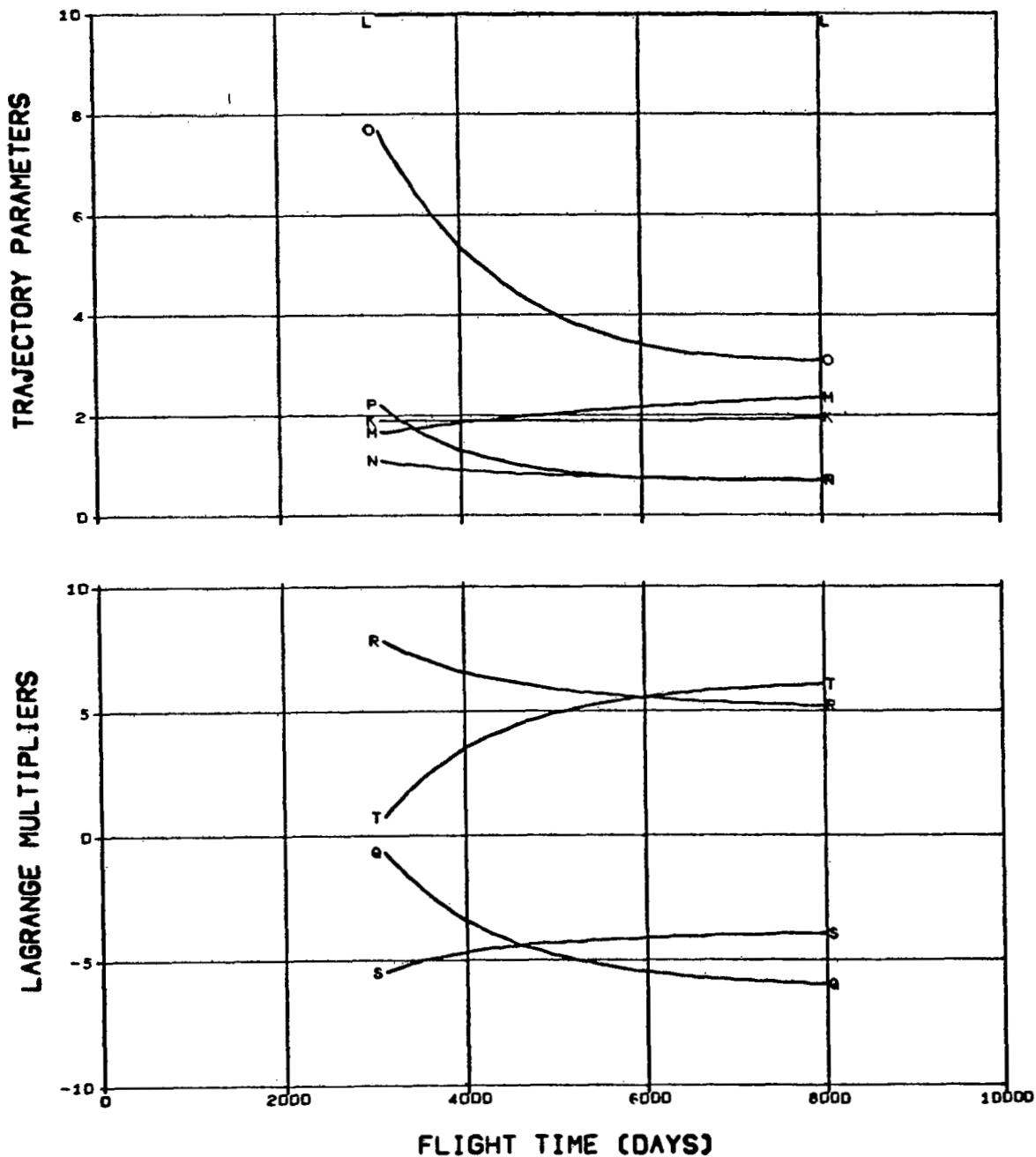
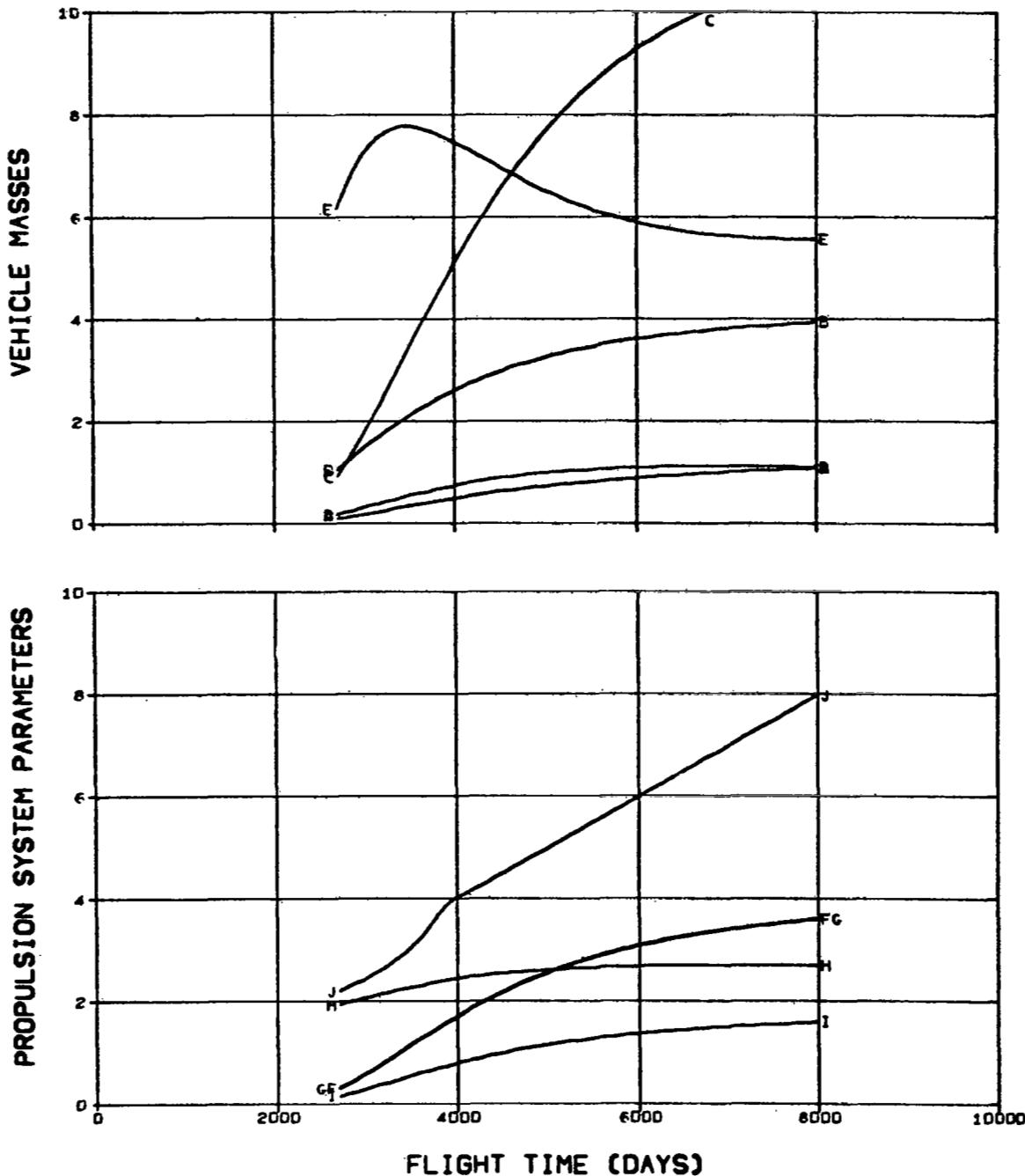


FIG. 7.3.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 7.3.2 URANUS MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)/1D P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER/1D
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

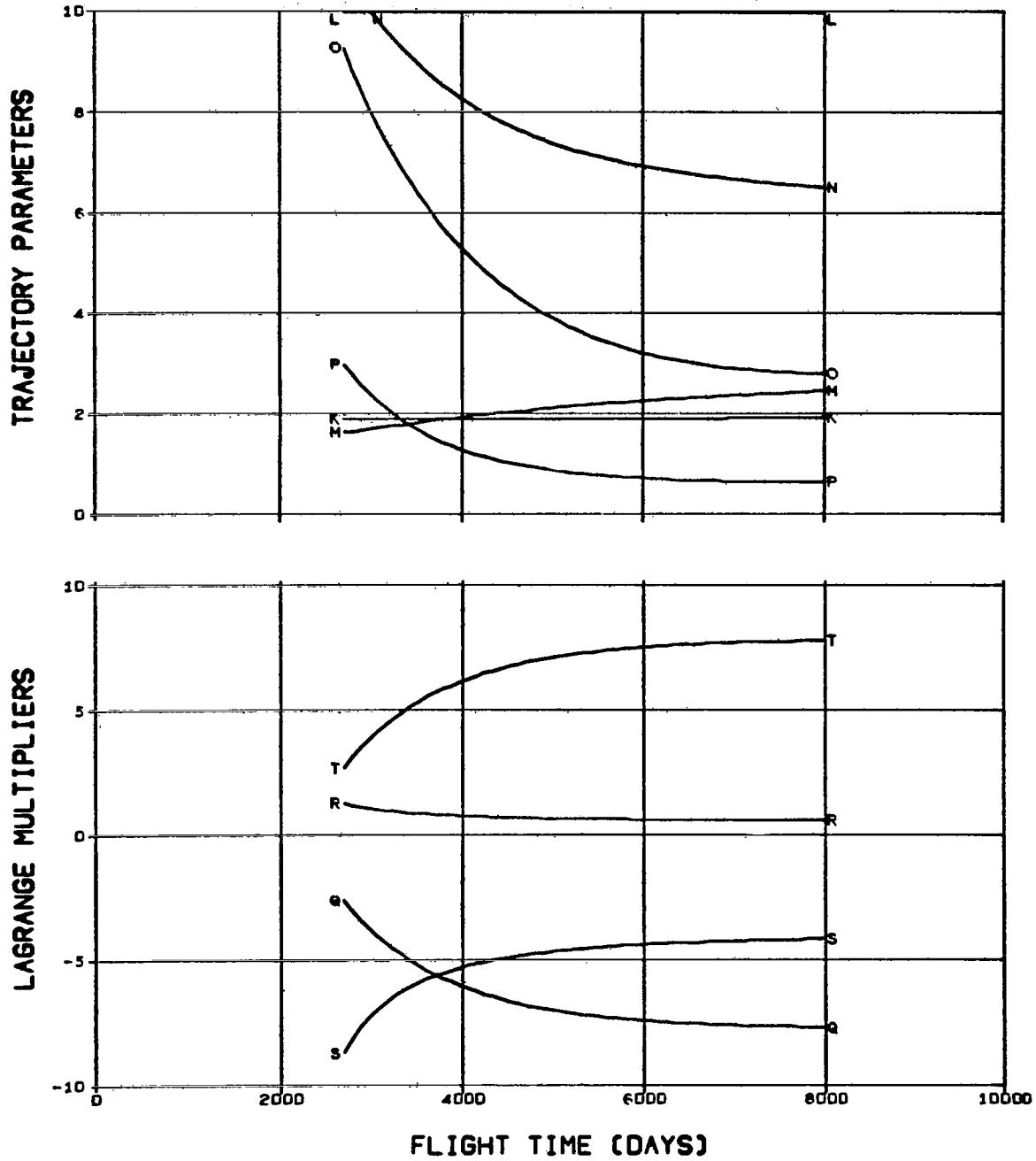


FIG. 7.3.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

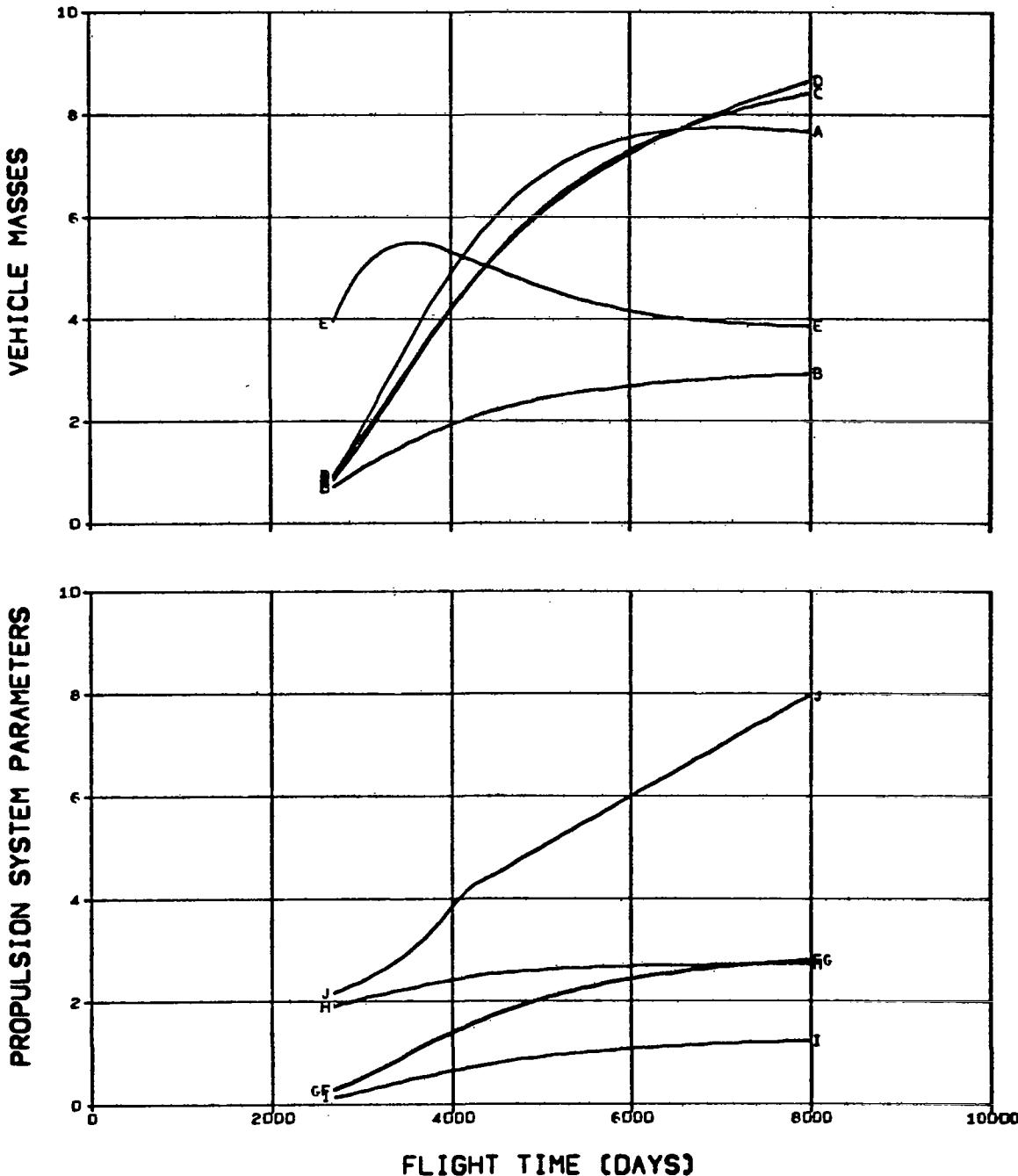


FIG. 7.3.3 URANUS MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/1D
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/1D
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

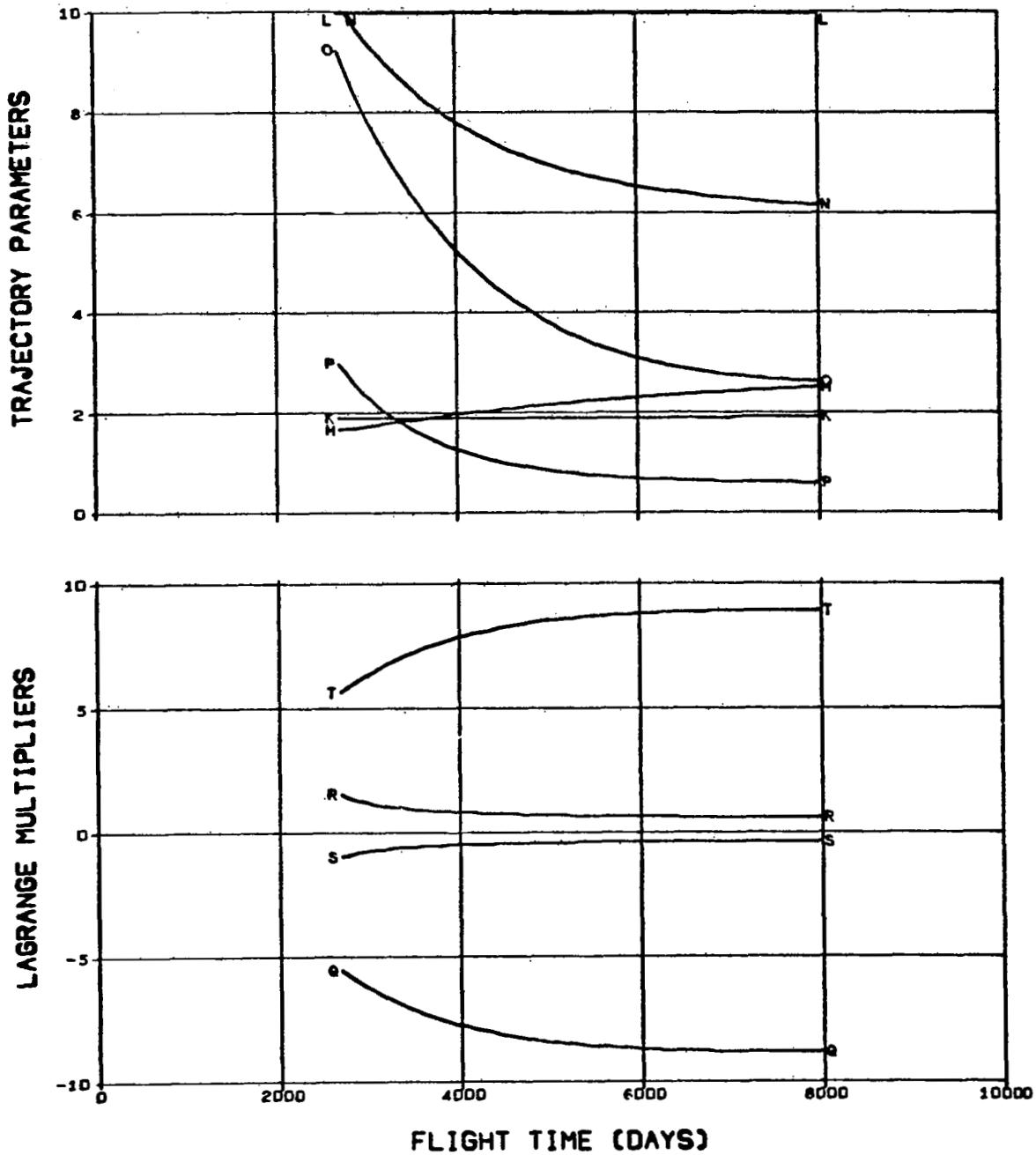
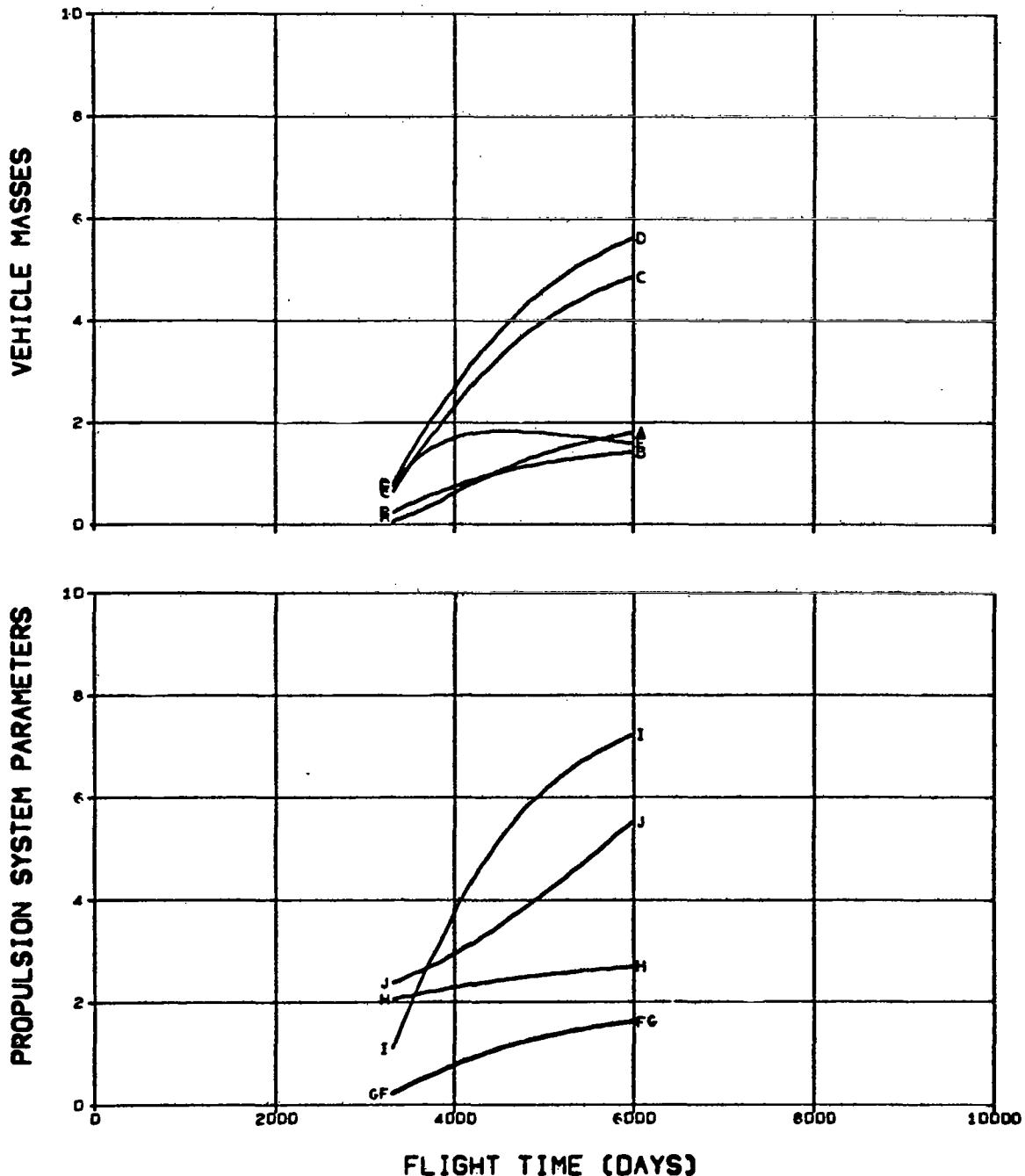


FIG. 7.3.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 7.3.4 URANUS MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE/10
 T Y-COMPONENT OF PRIMER DERIVATIVE

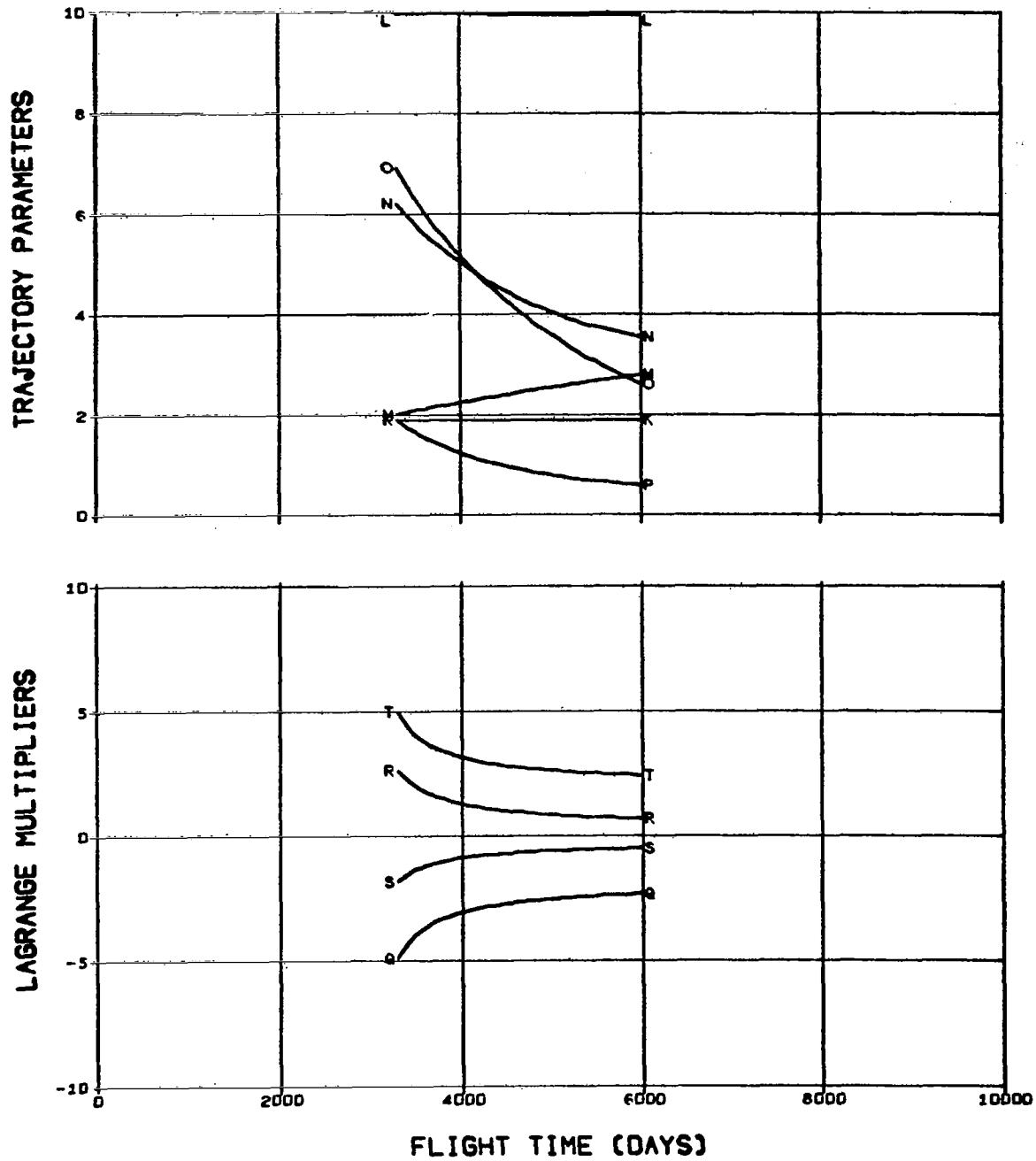


FIG. 7.3.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100.
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/1000

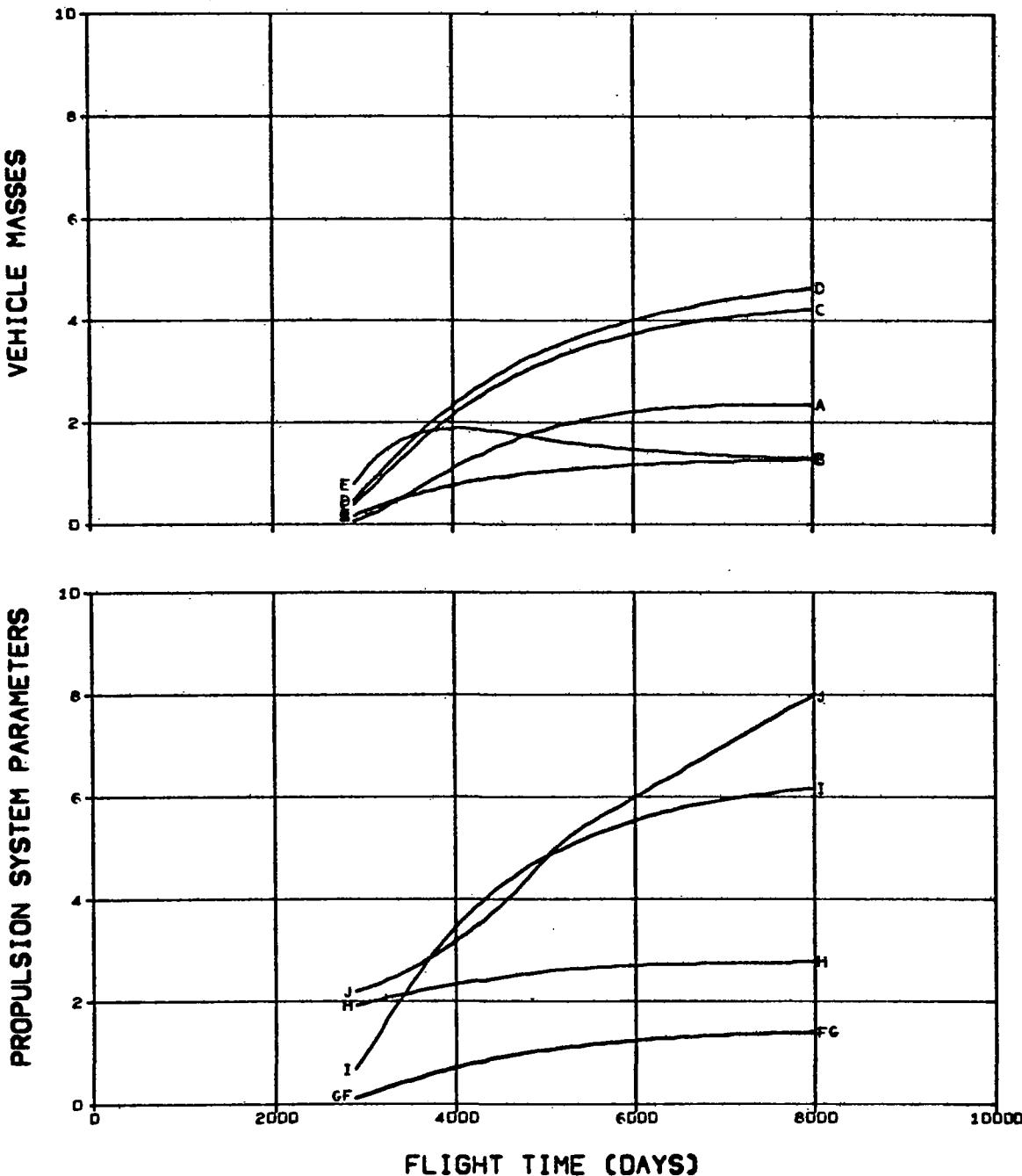


FIG. 7.3.5 URANUS MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE/10
 T Y-COMPONENT OF PRIMER DERIVATIVE

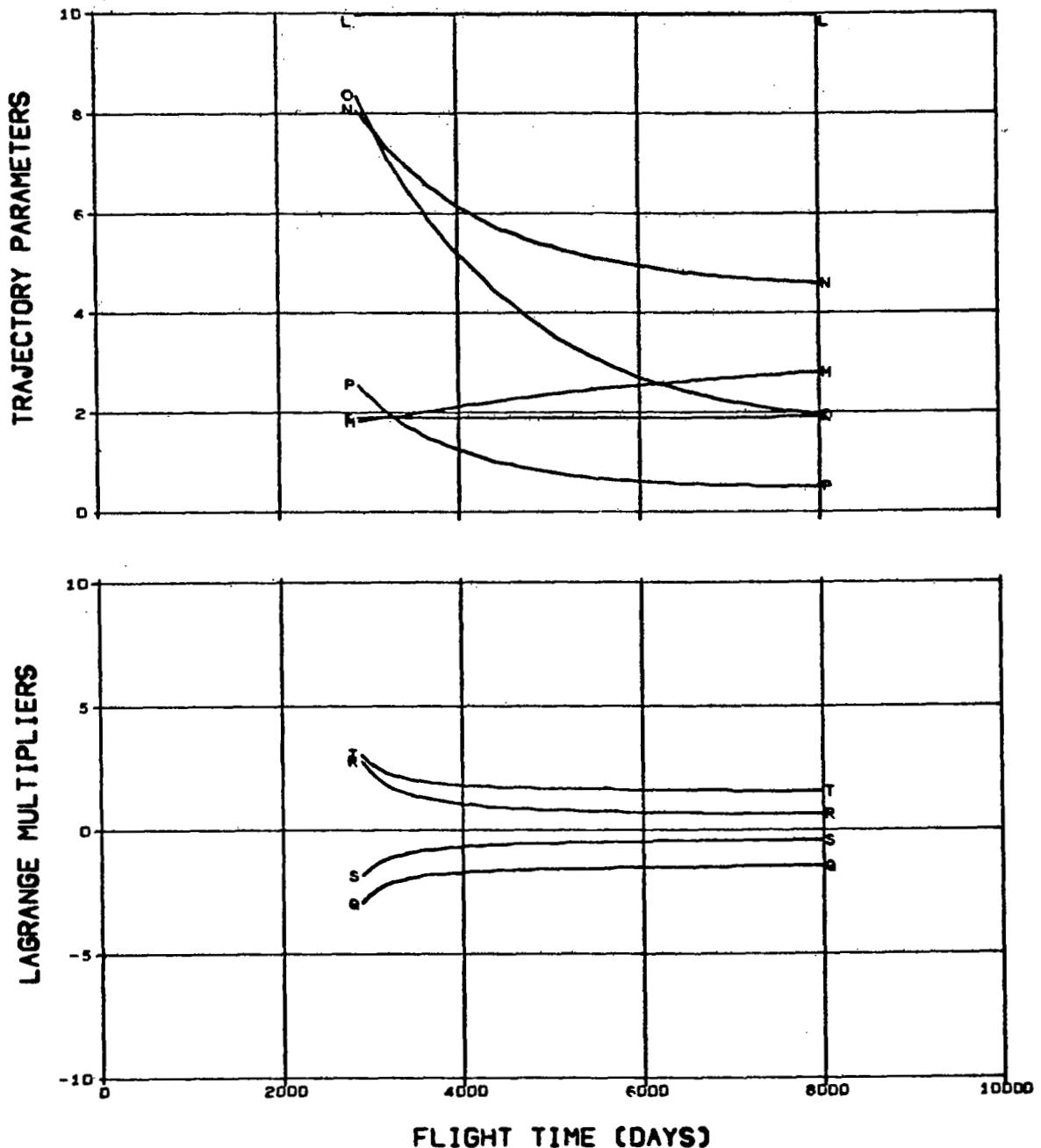


FIG. 7.3.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/100	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

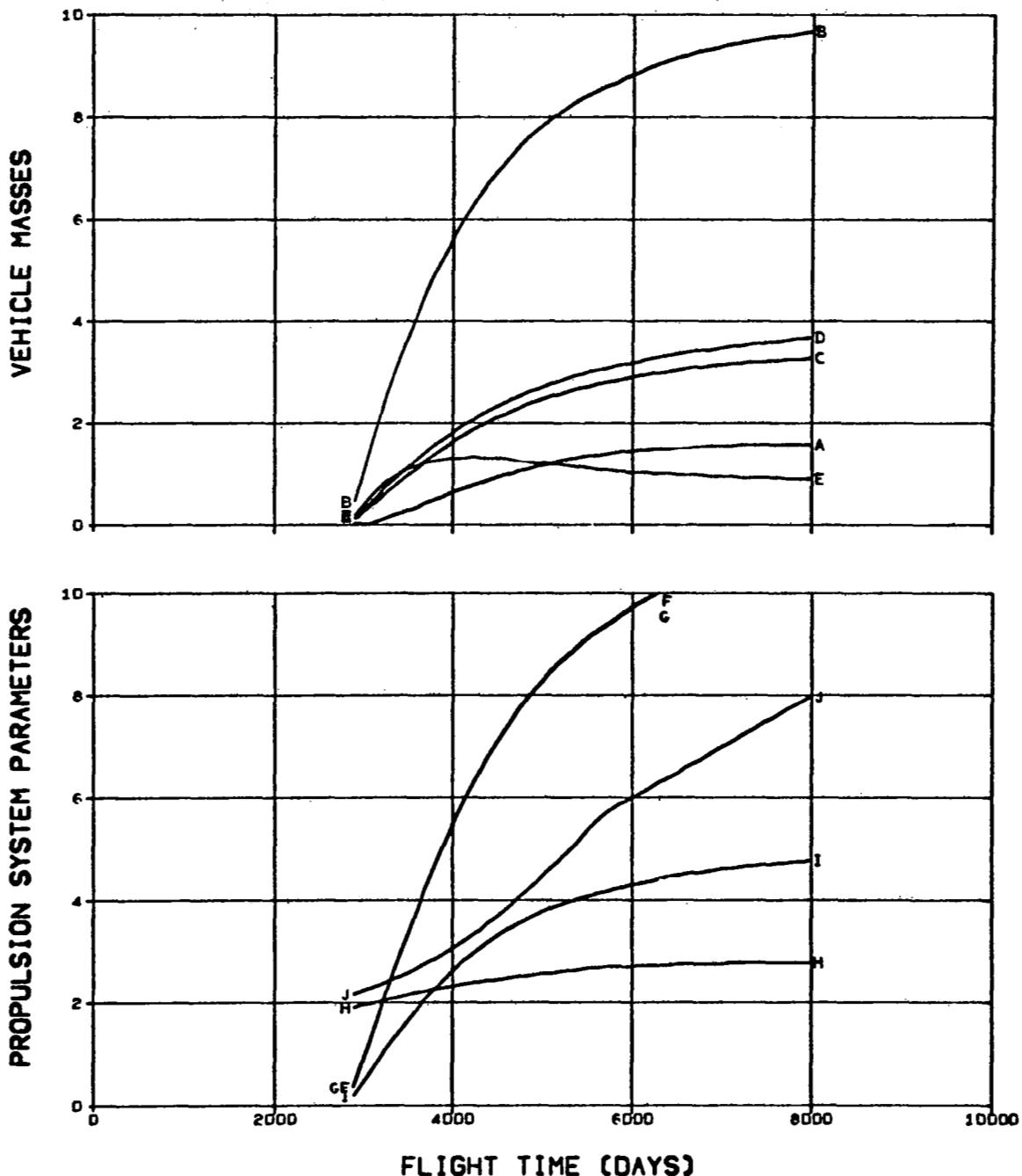


FIG. 7.3.6 URANUS MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE/10
 T Y-COMPONENT OF PRIMER DERIVATIVE

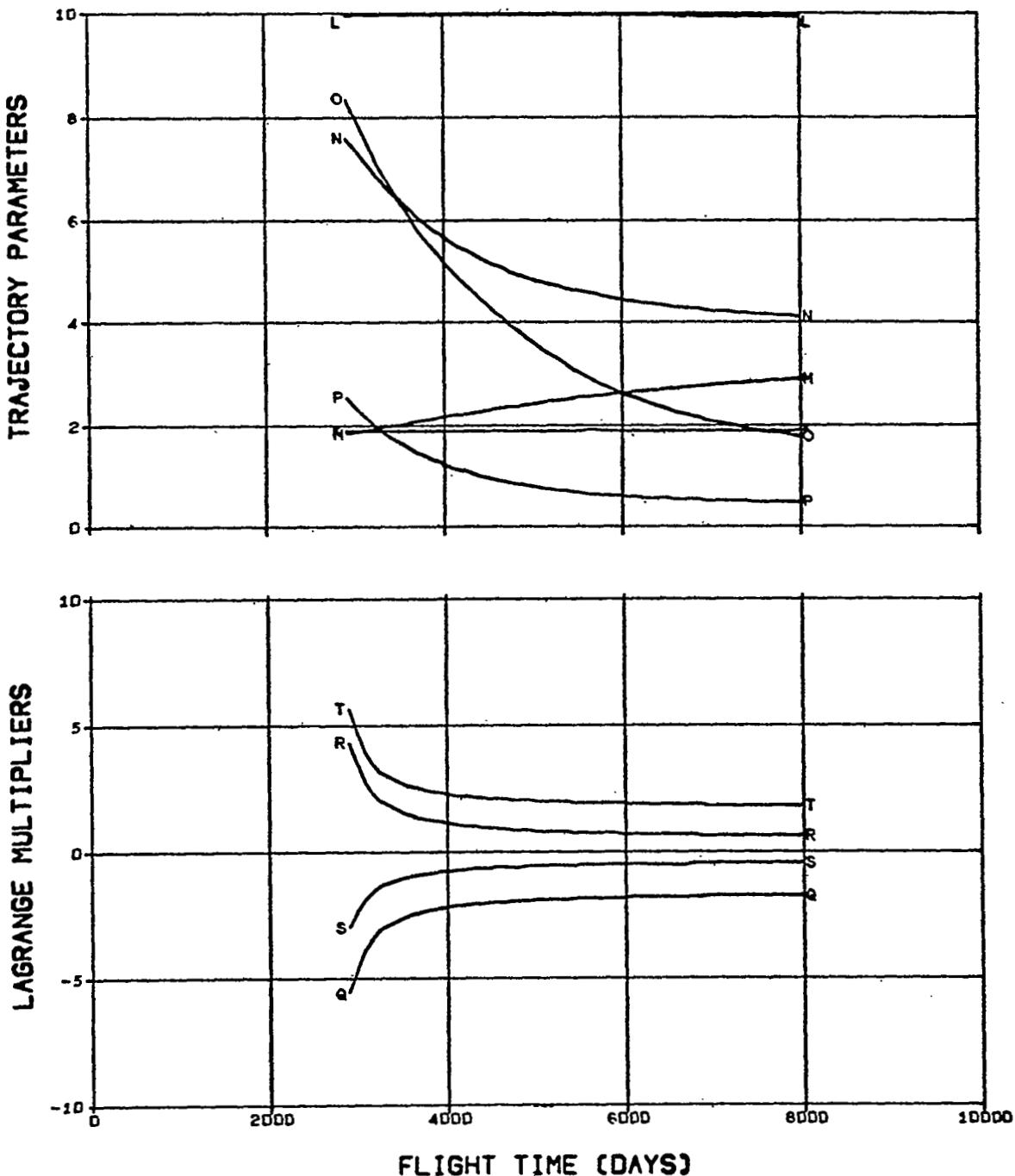


FIG. 7.3.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

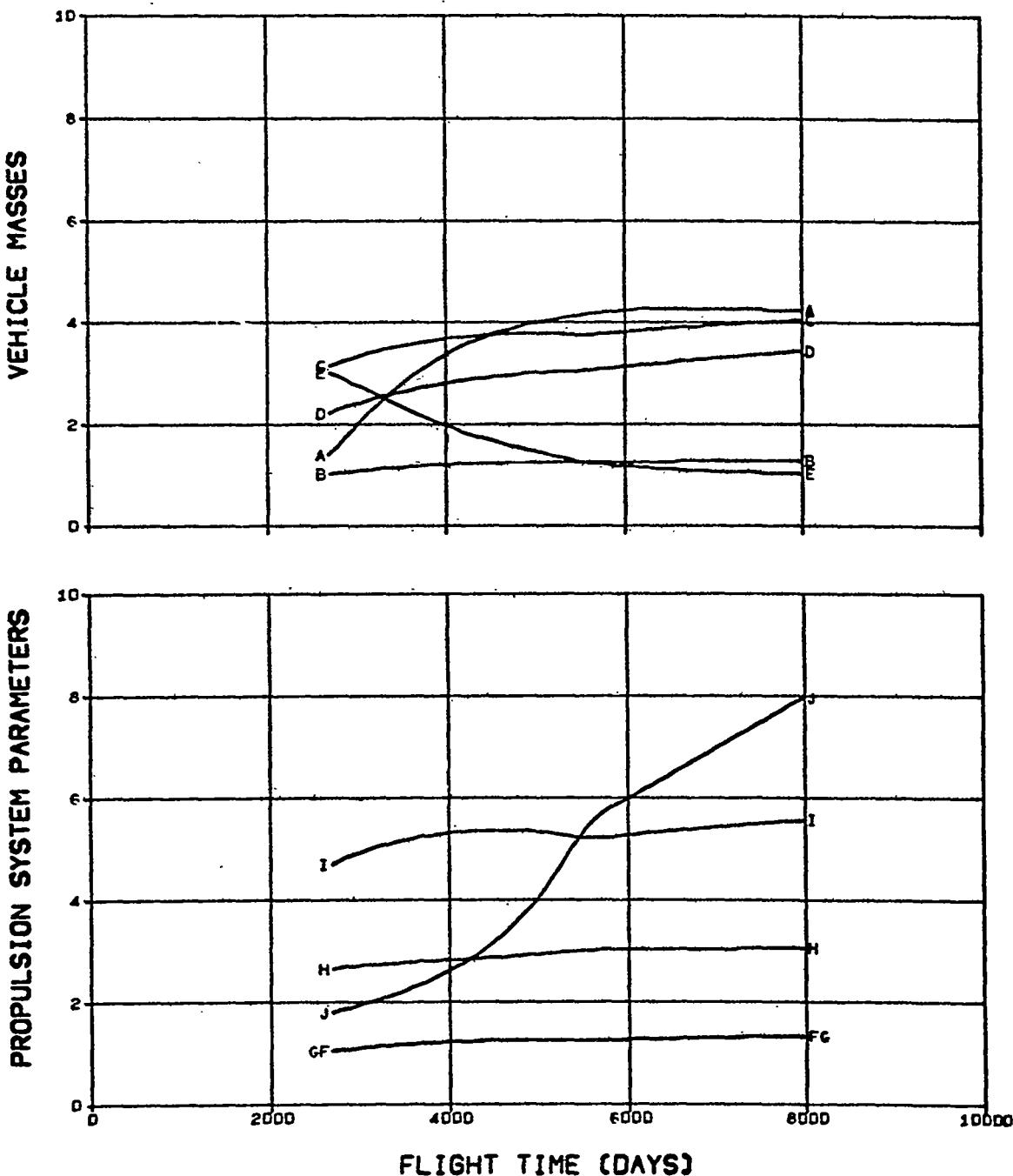


FIG. 7.4.1 URANUS MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

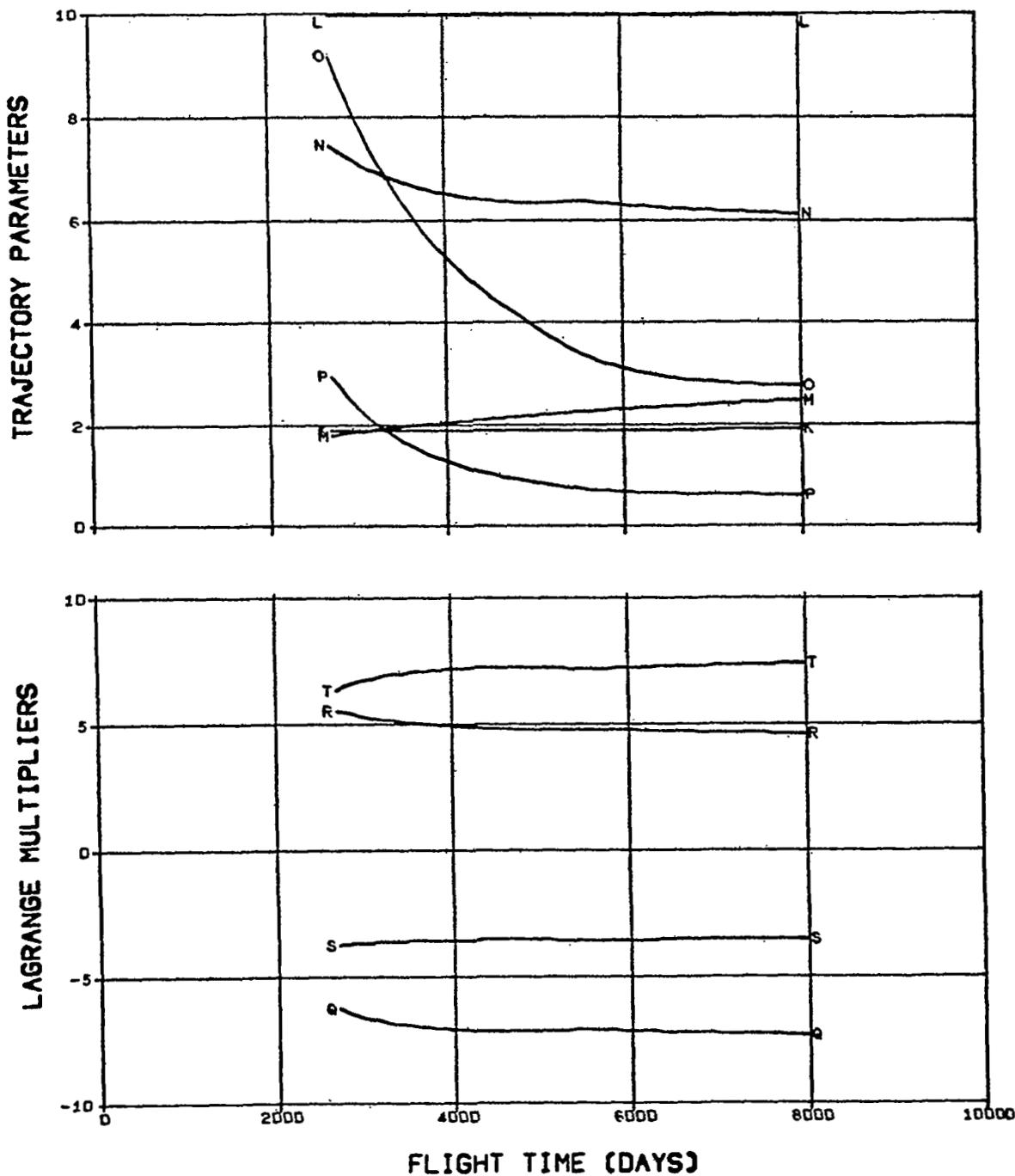


FIG. 7.4.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

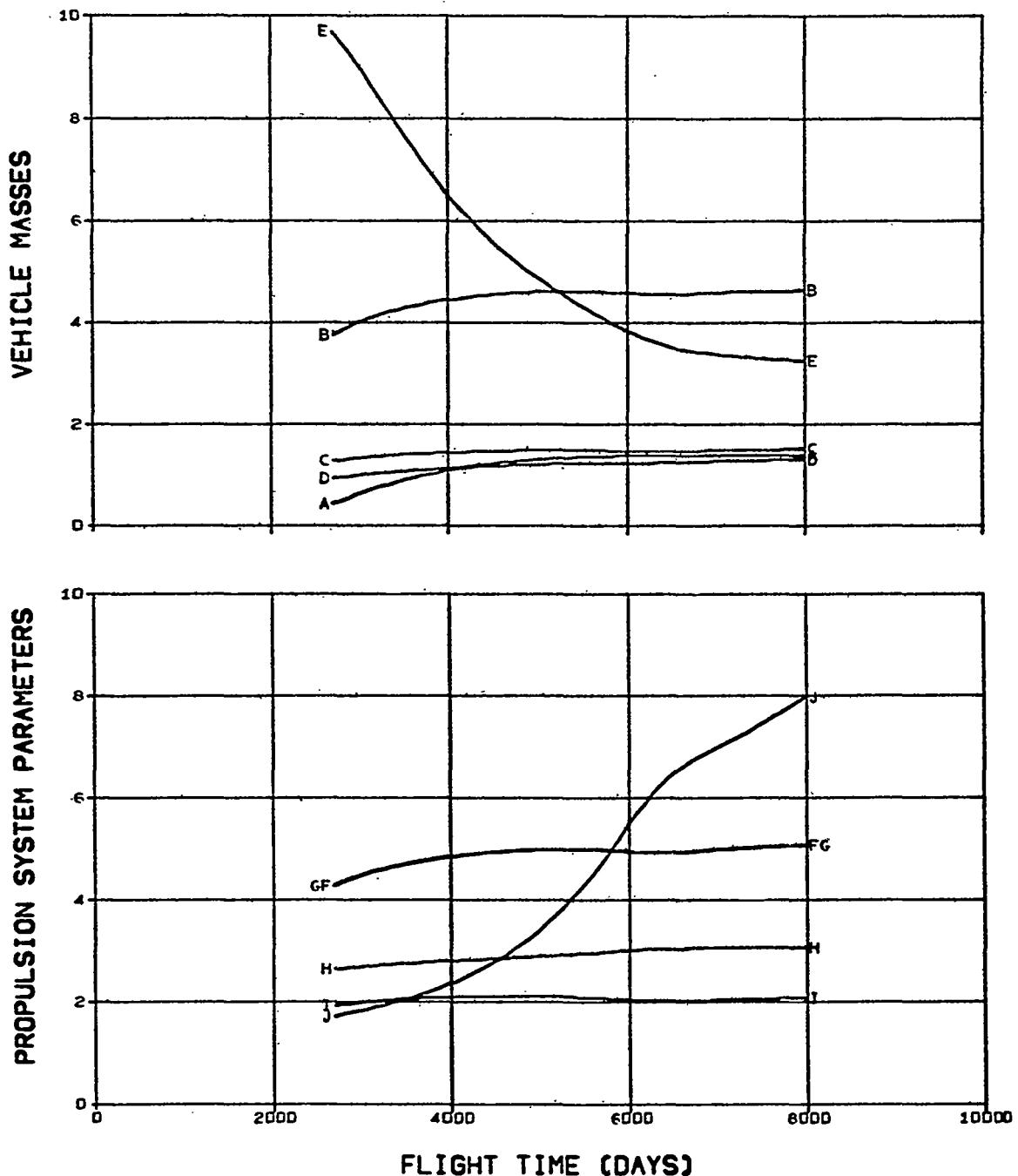


FIG. 7.4.2 URANUS MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000.
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

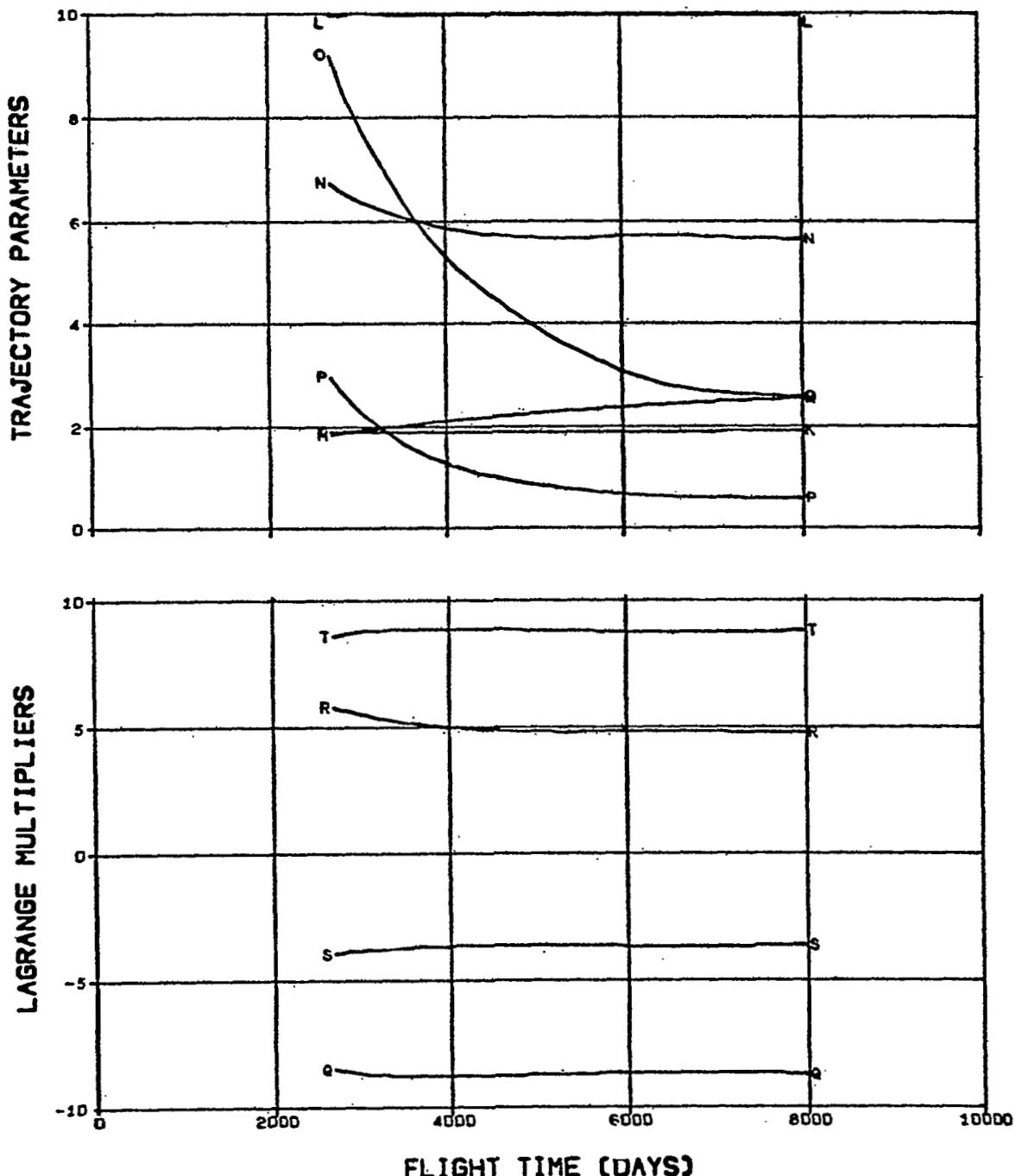


FIG. 7.4.2 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/1000

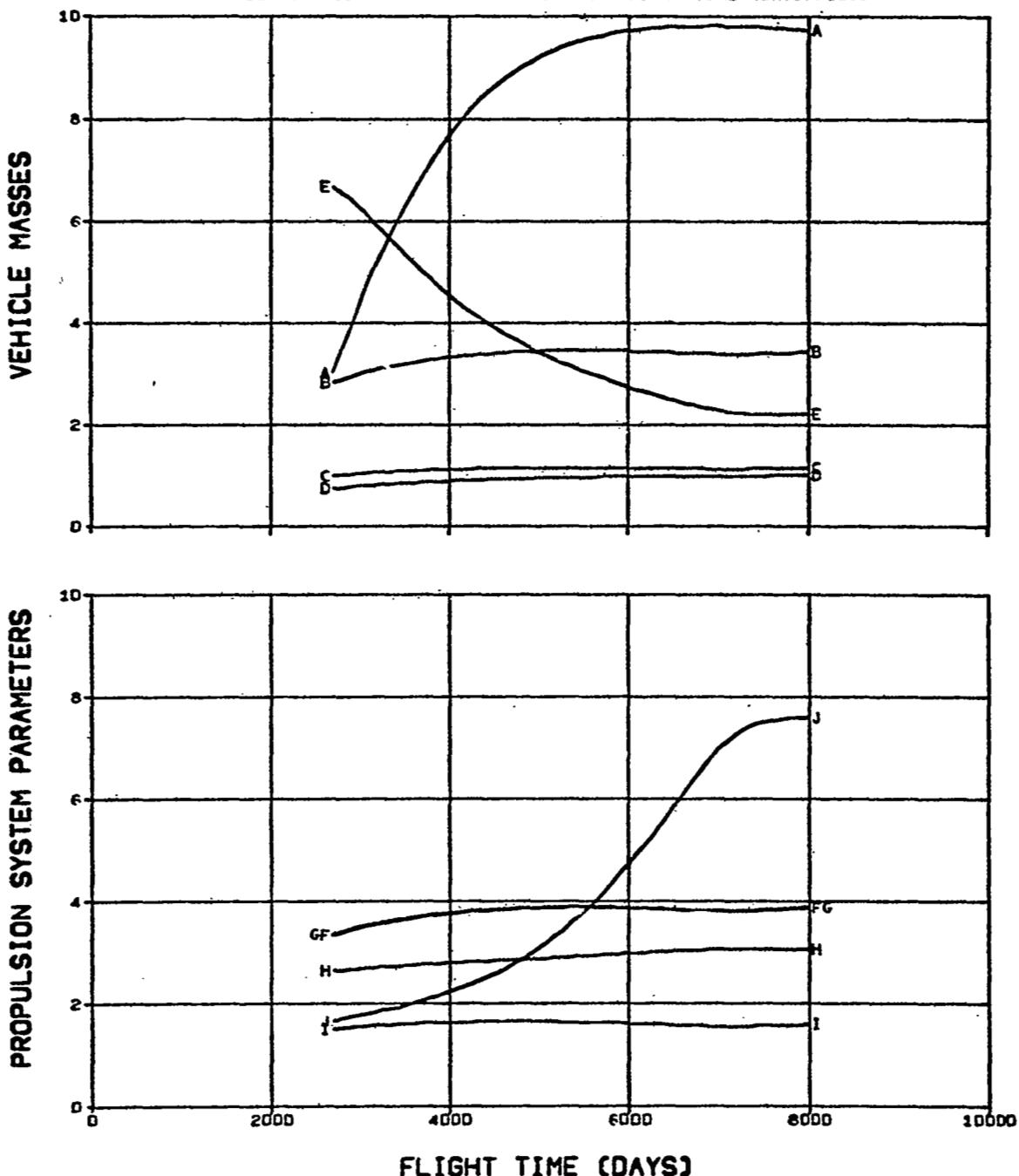


FIG. 7.4.3 URANUS MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE

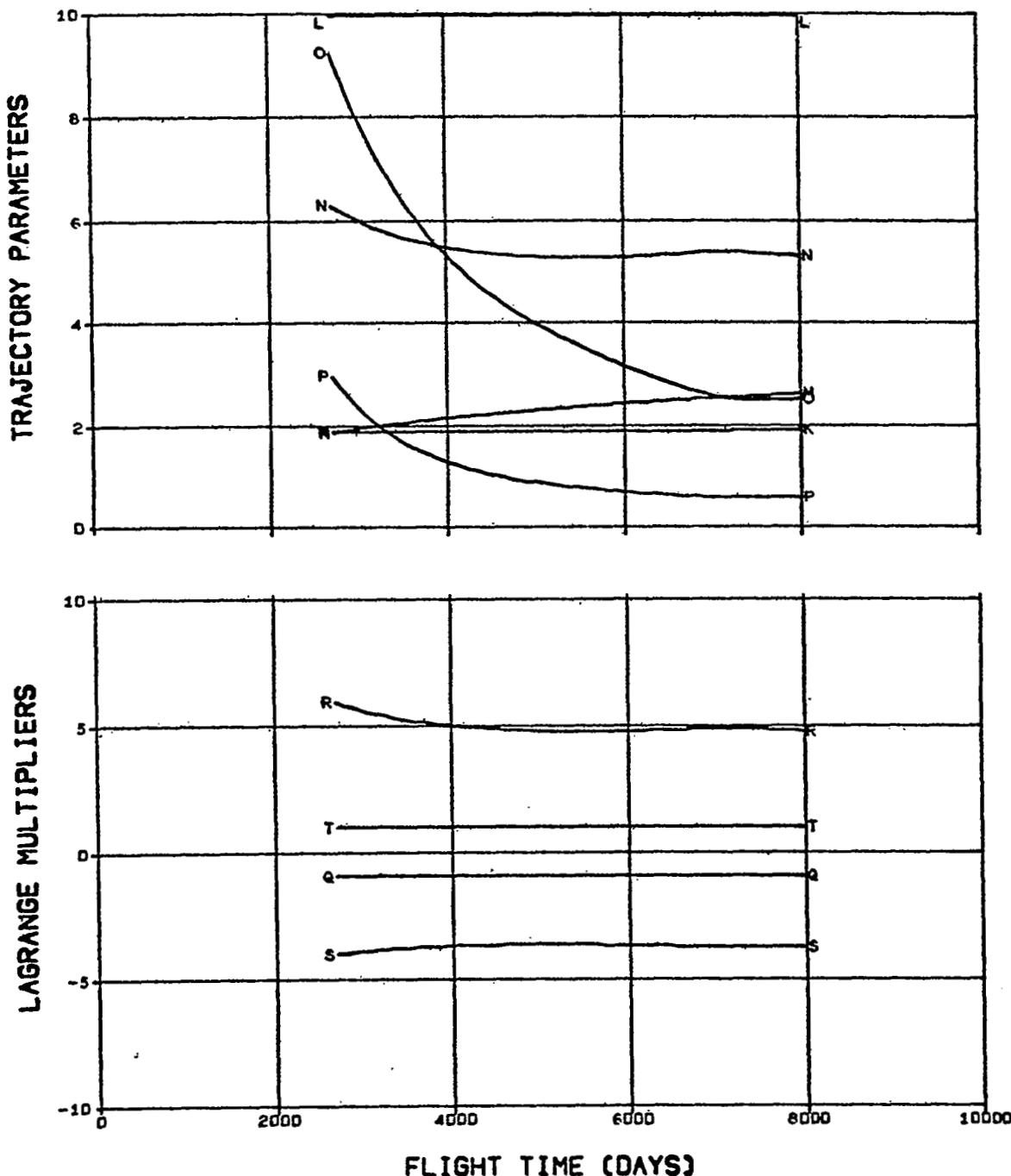


FIG. 7.4.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/1000

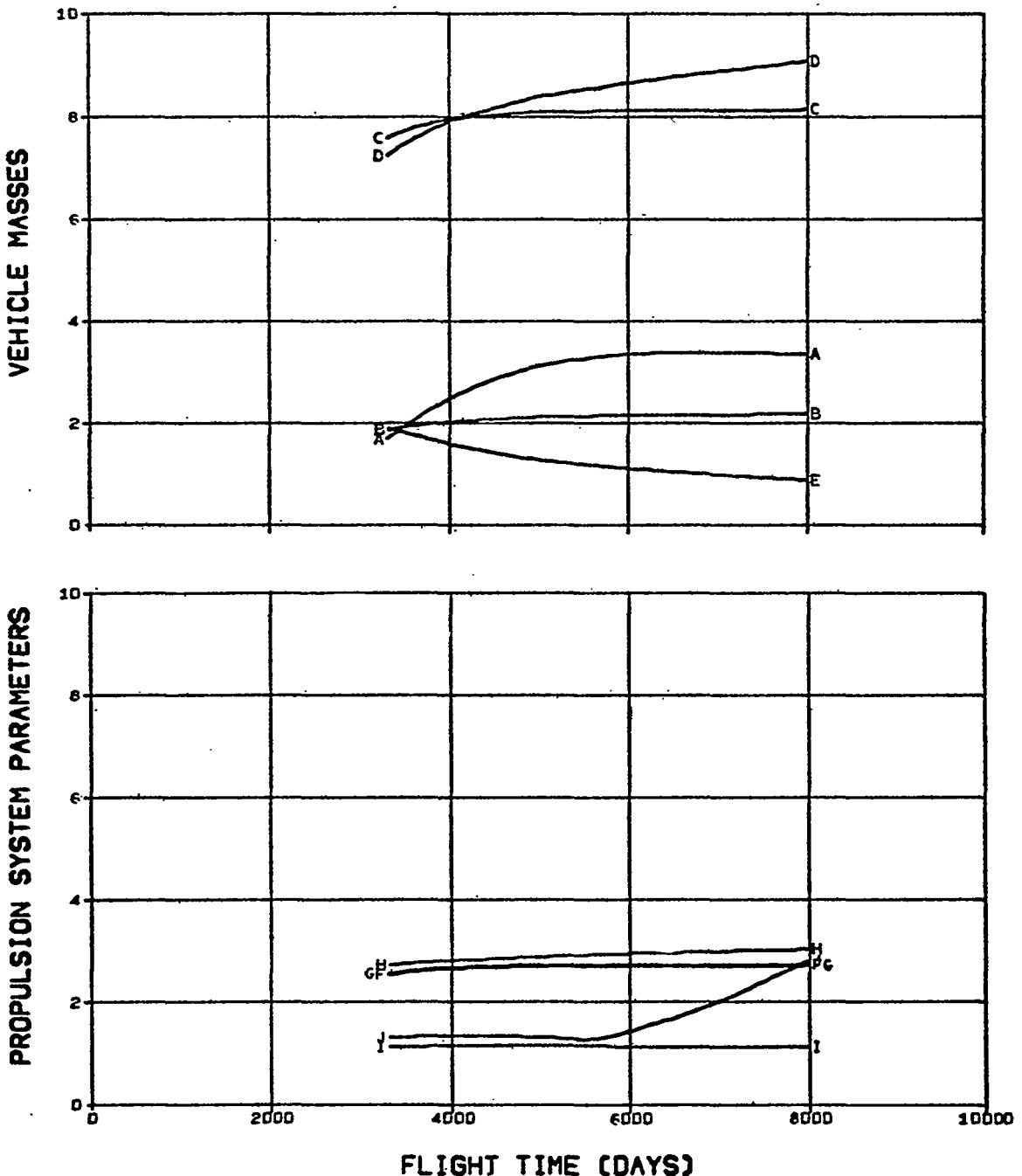


FIG. 7.4.4 URANUS MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE

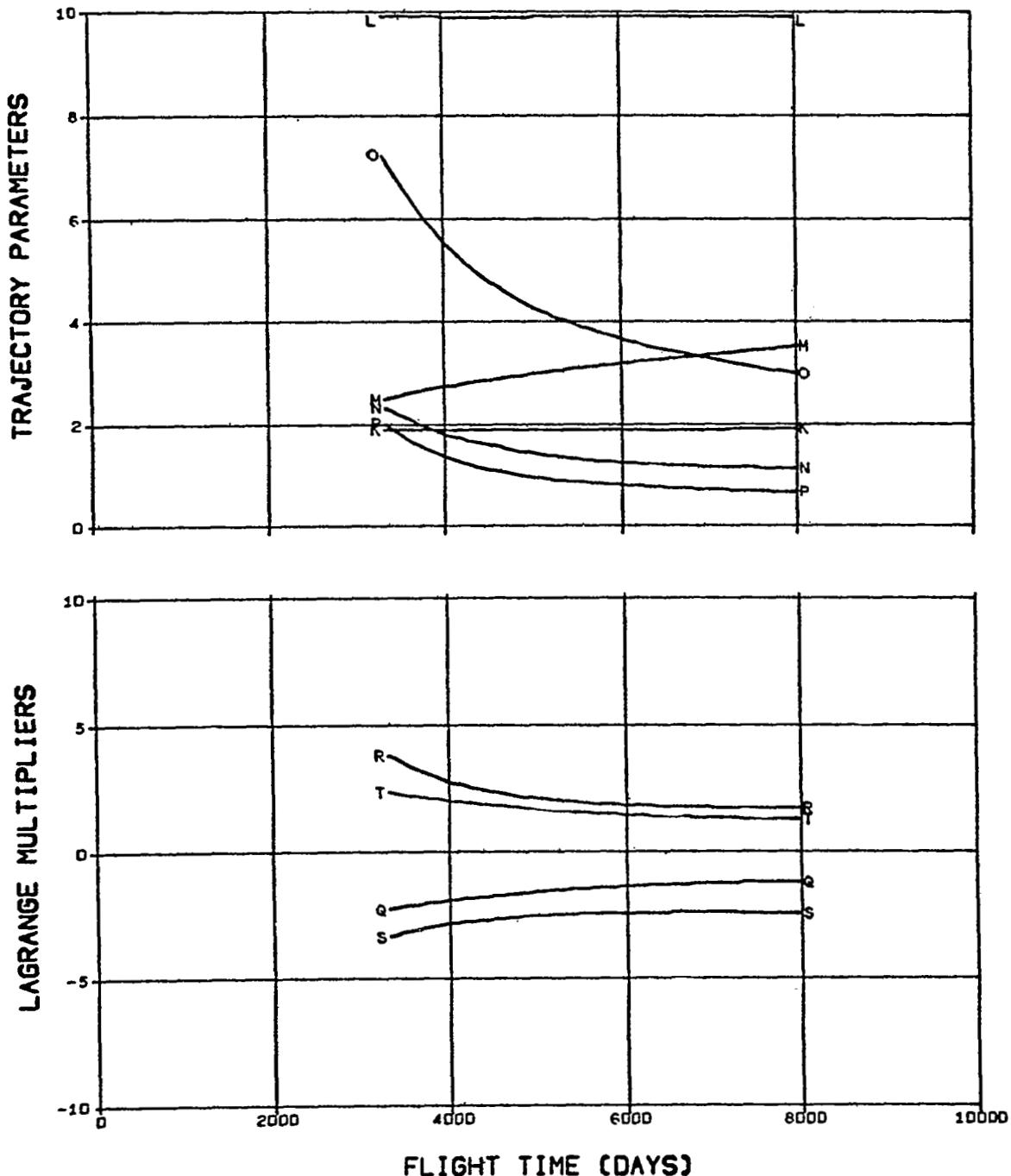


FIG. 7.4.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

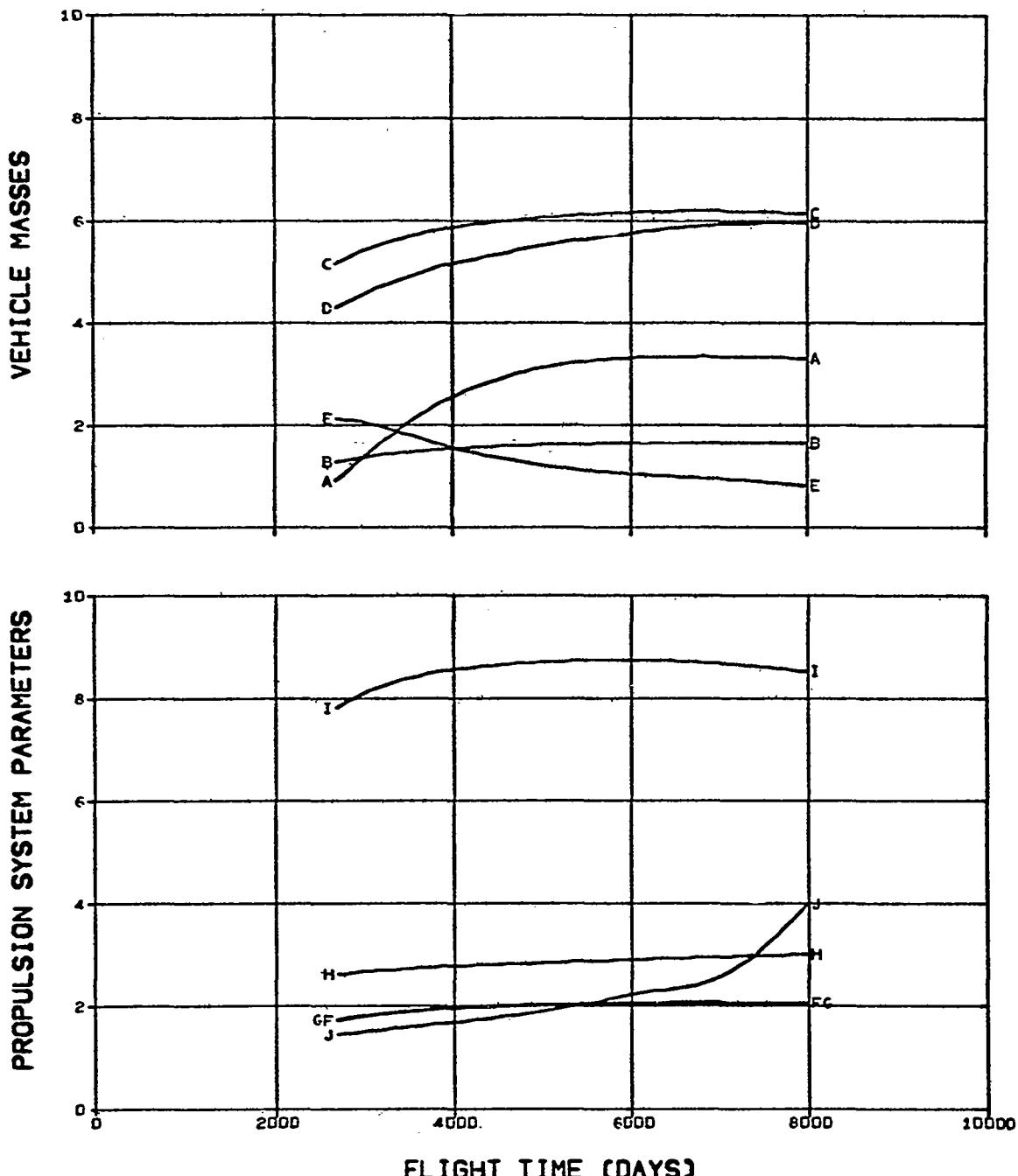


FIG. 7.4.5 URANUS MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

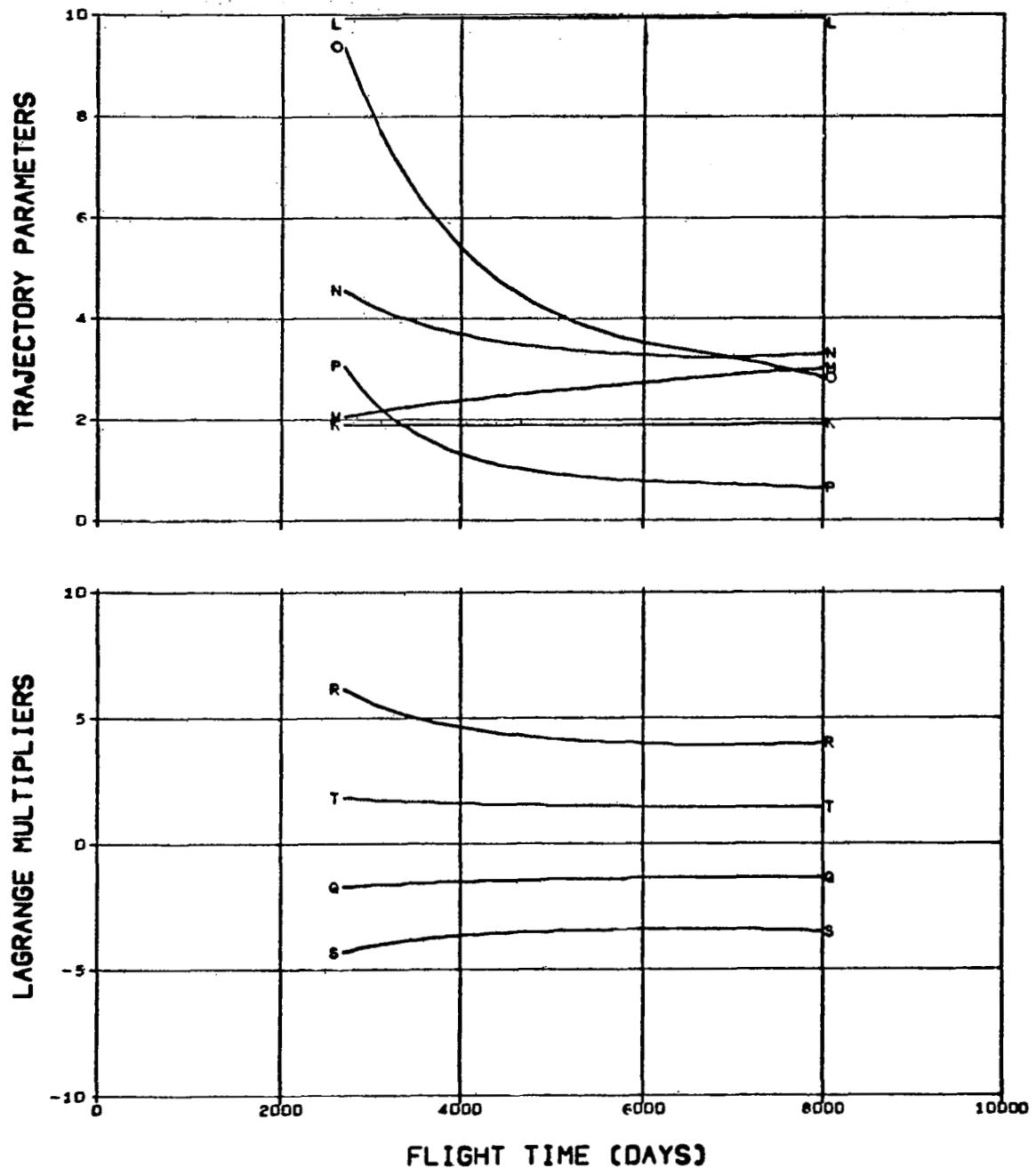


FIG. 7.4.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/100	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

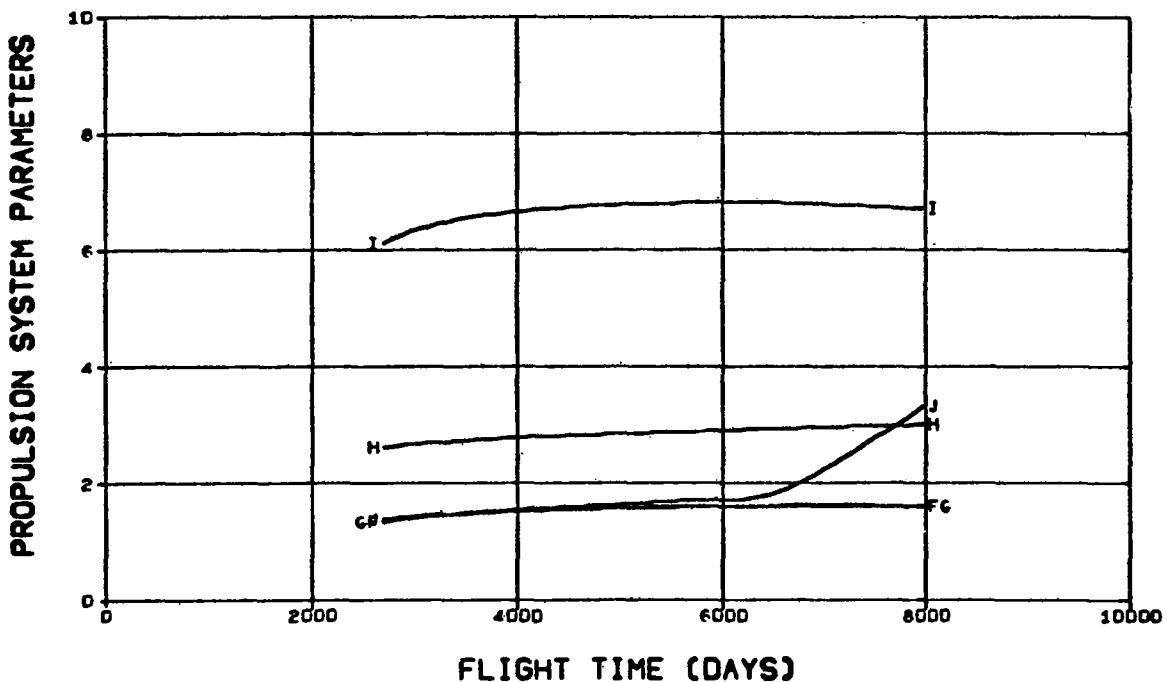
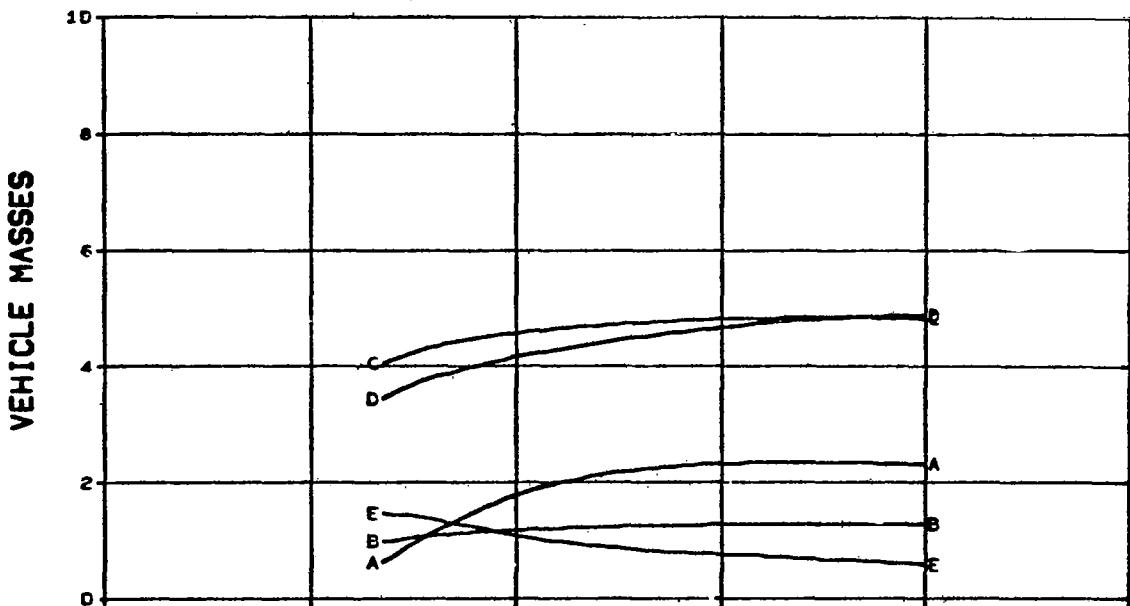


FIG. 7.4.6 URANUS MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	S	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPARTRIC TRAVEL ANGLE (DEC)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

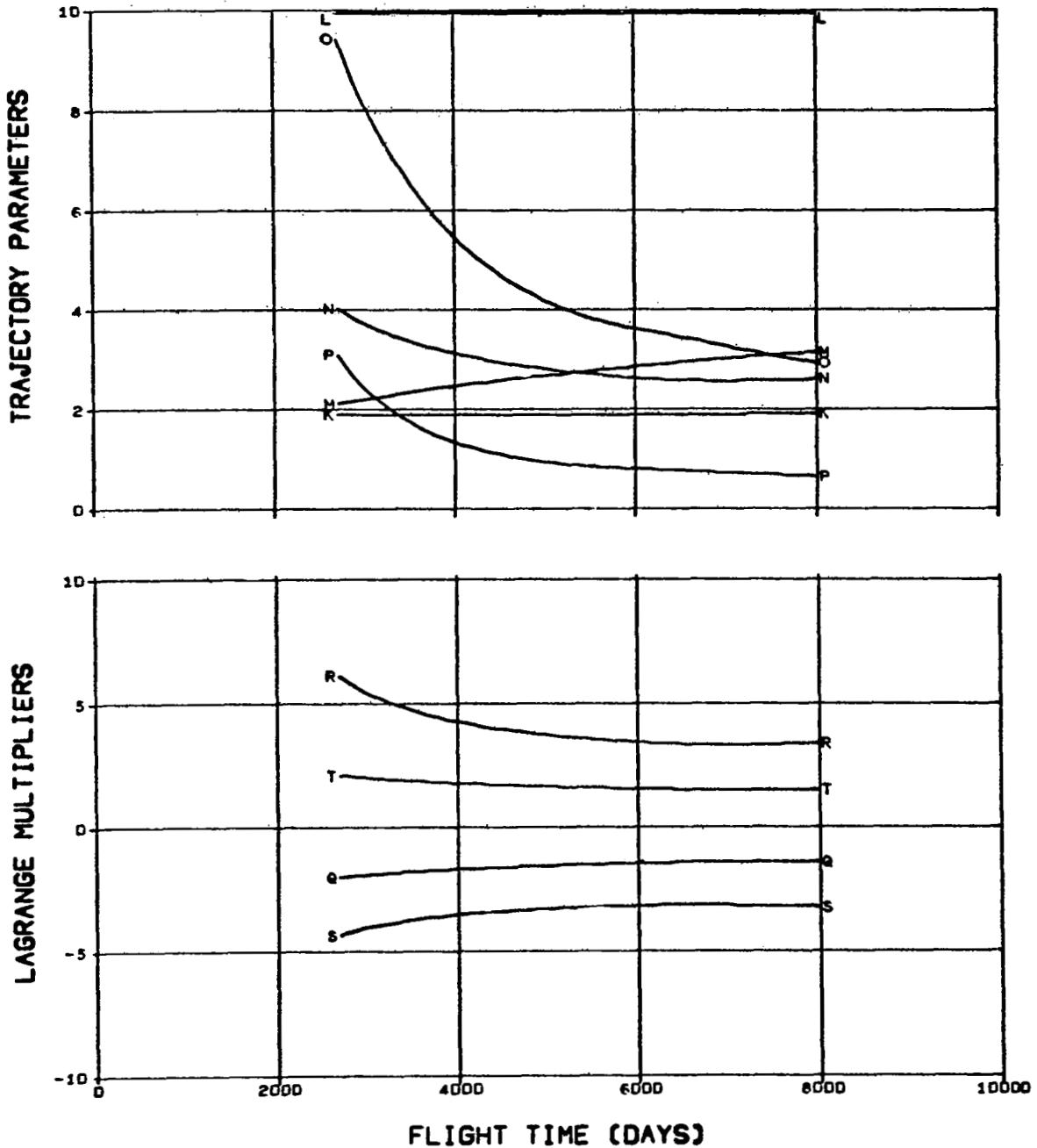


FIG. 7.4.6 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/100
B INITIAL SPACECRAFT MASS (KG)/10000	G MAXIMUM POWER (KW)/100
C PROPULSION SYSTEM MASS (KG)/1000	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
E RETRO-PROPELLANT MASS (KG)/1000	J PROPULSION TIME (DAYS)/1000

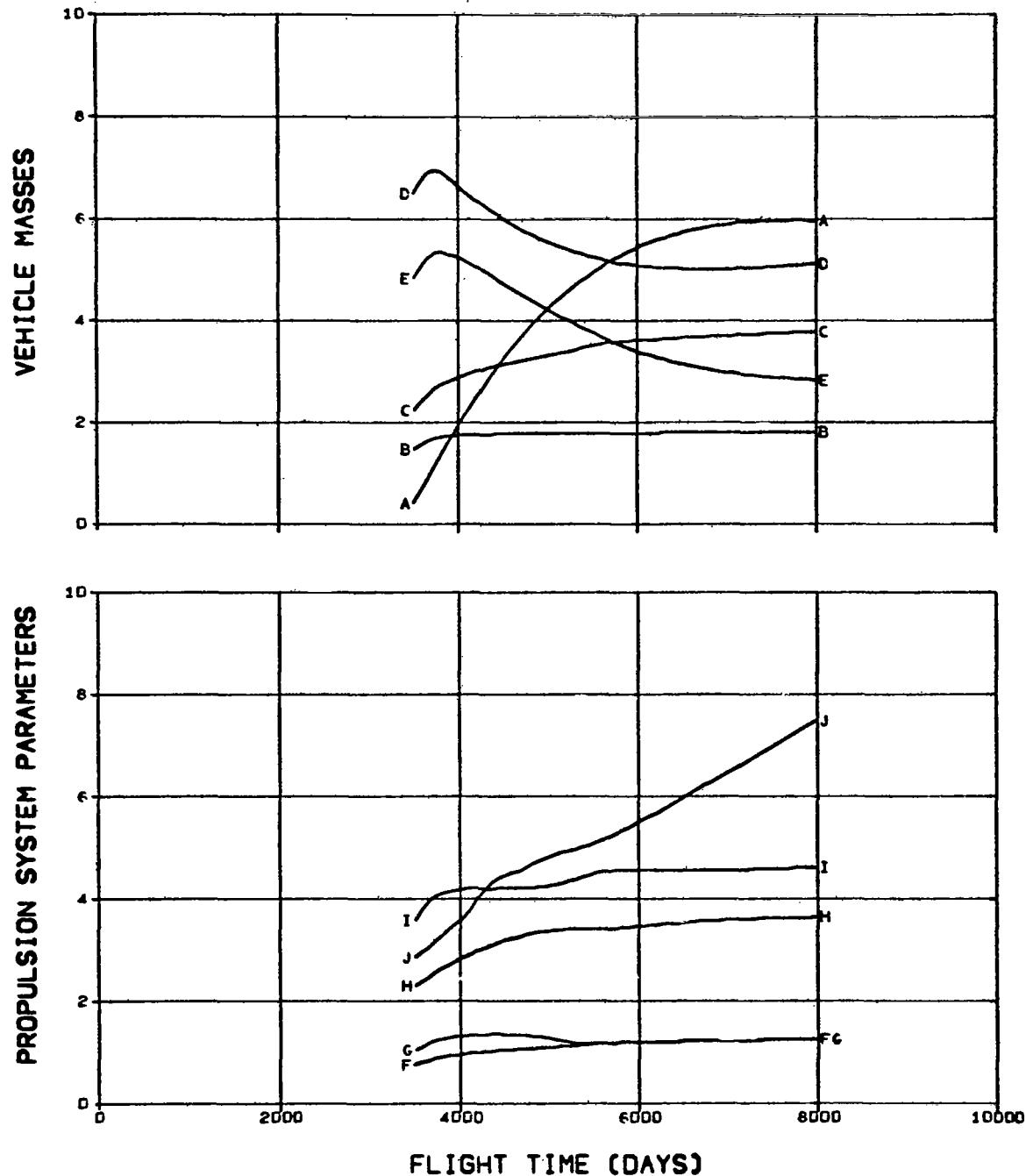


FIG. 7.5.1 URANUS MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPELLANT SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

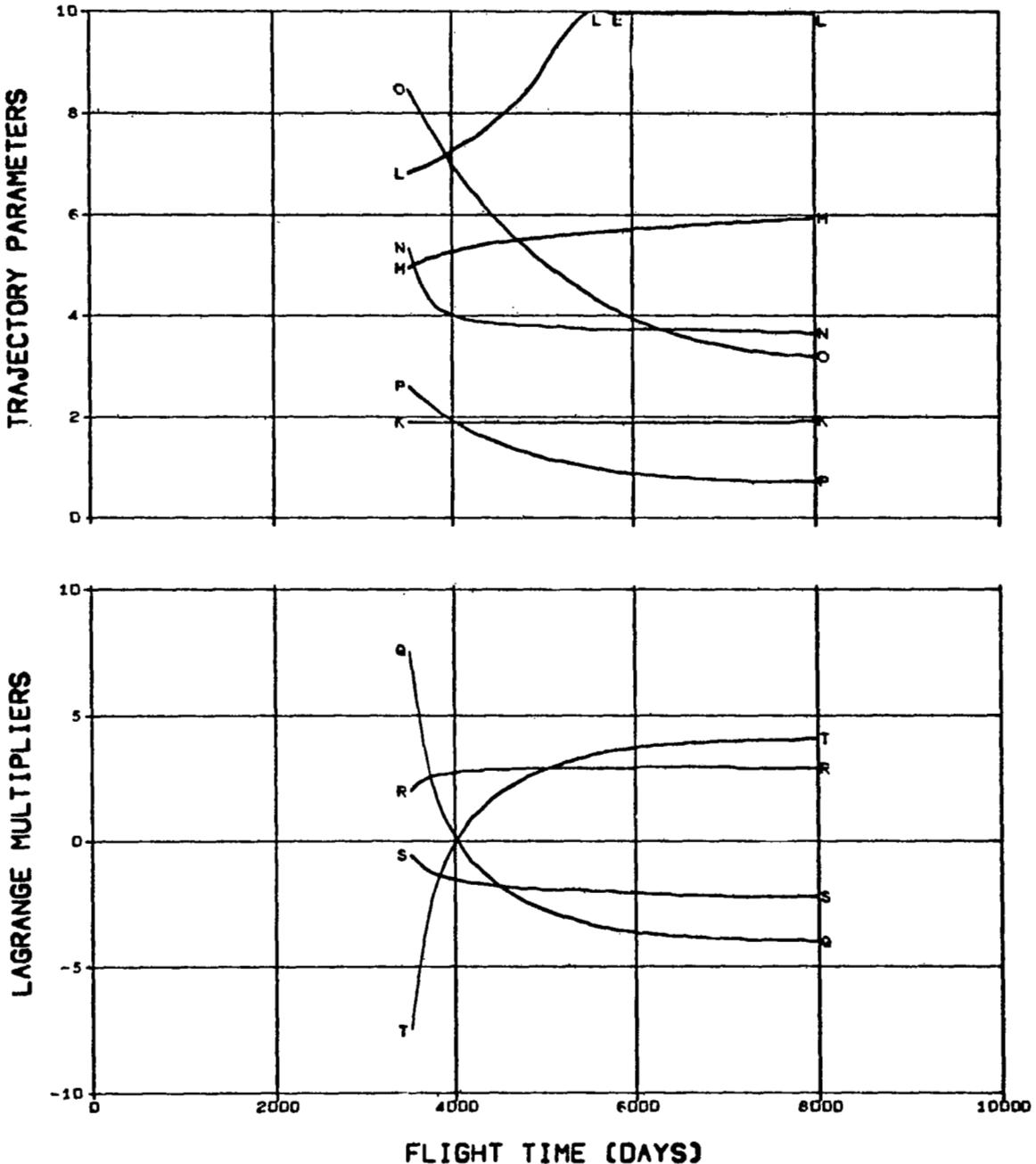


FIG. 7.5.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/1000	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/1000	J PROPULSION TIME (DAYS)/1000

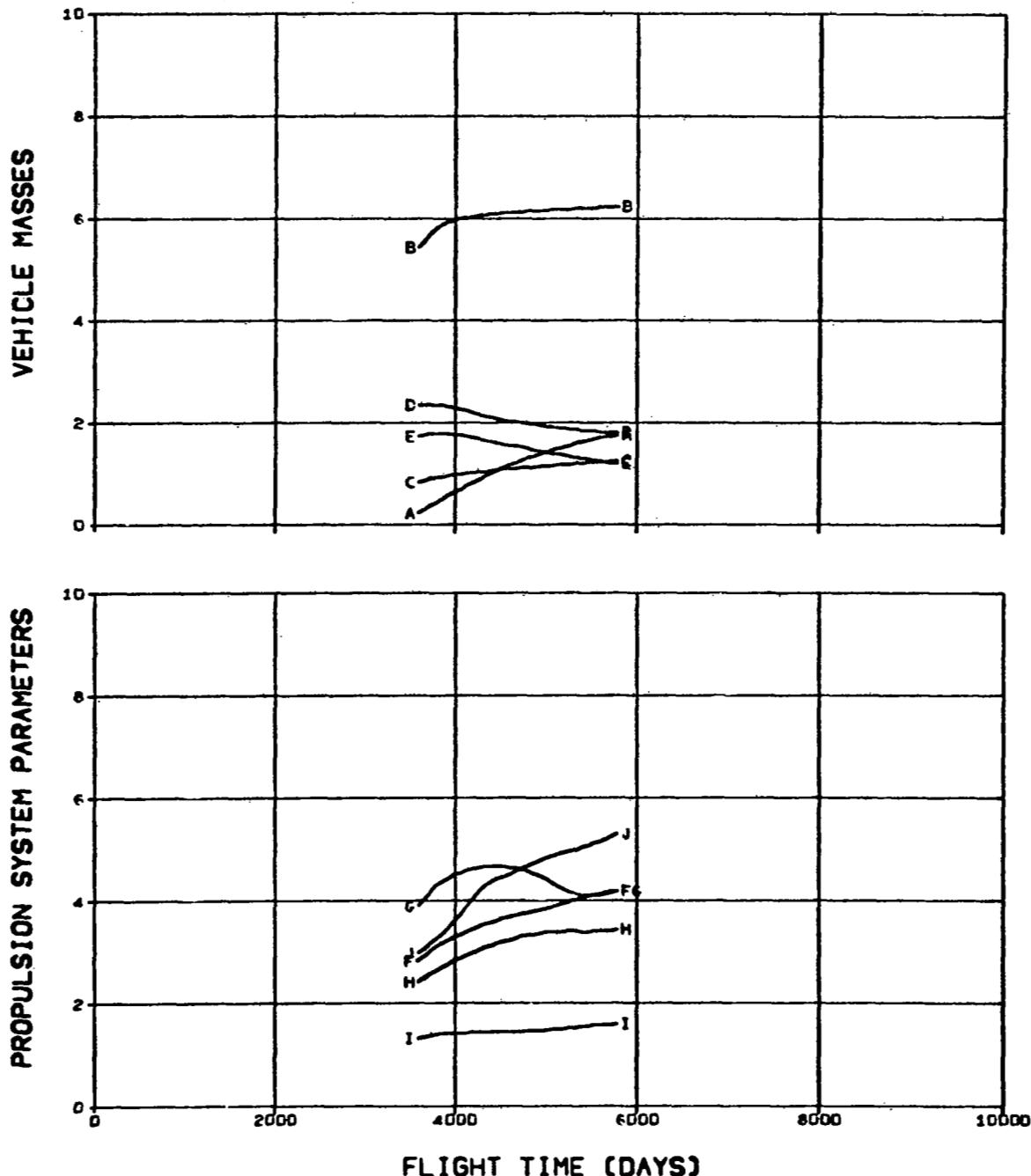


FIG. 7.5.2 URANUS MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

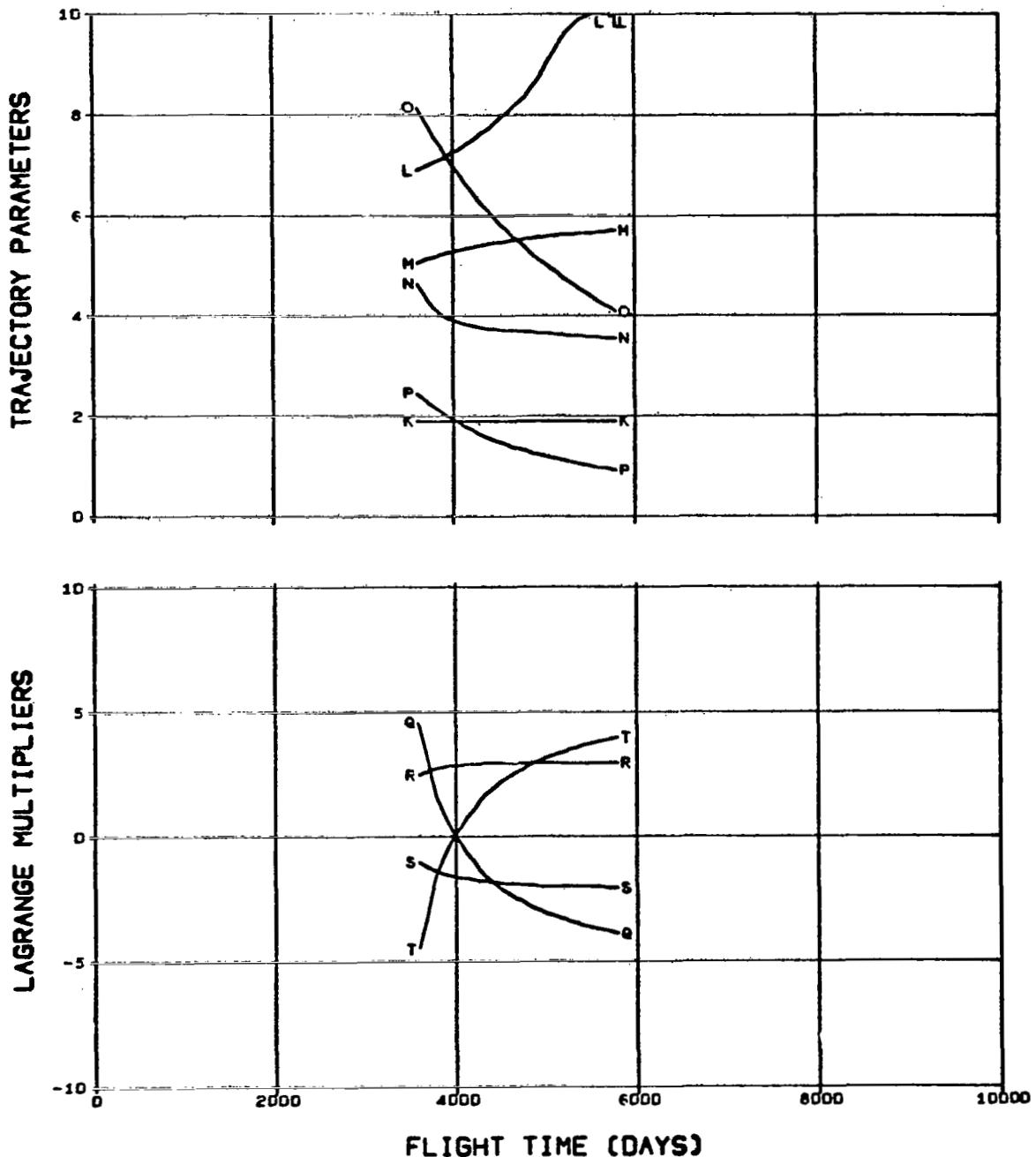
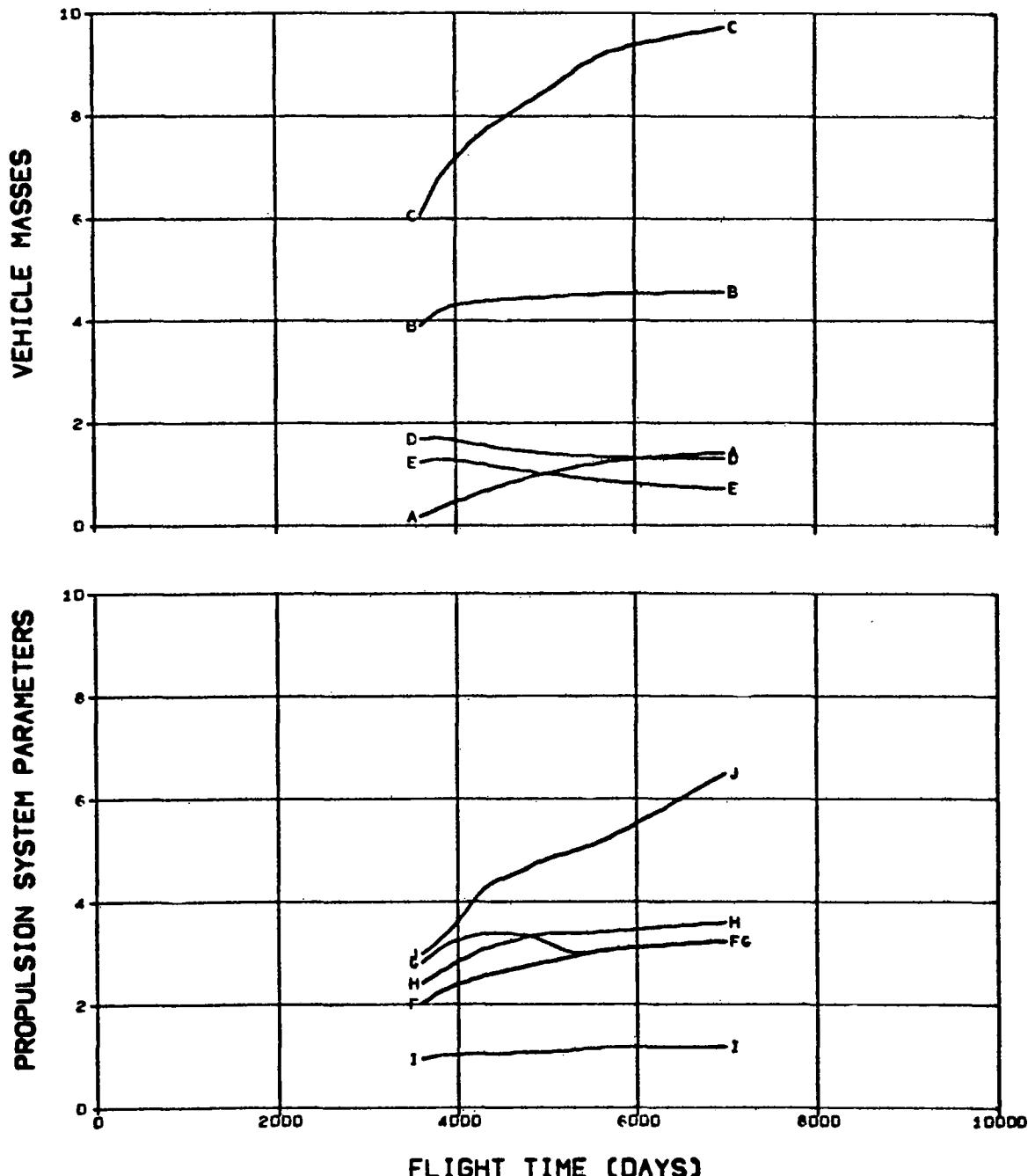


FIG. 7.5.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 7.5.3 URANUS MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

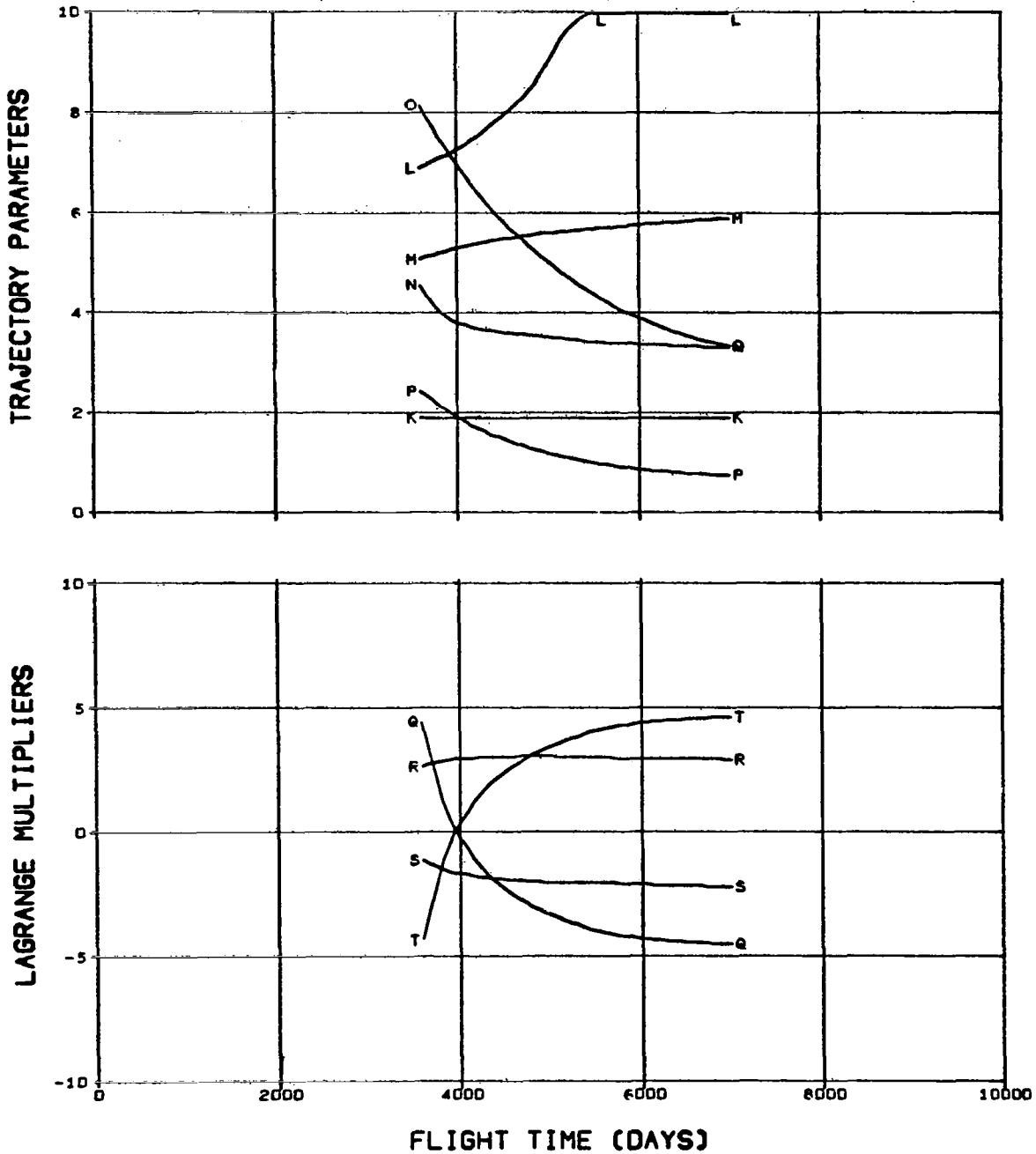


FIG. 7.5.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

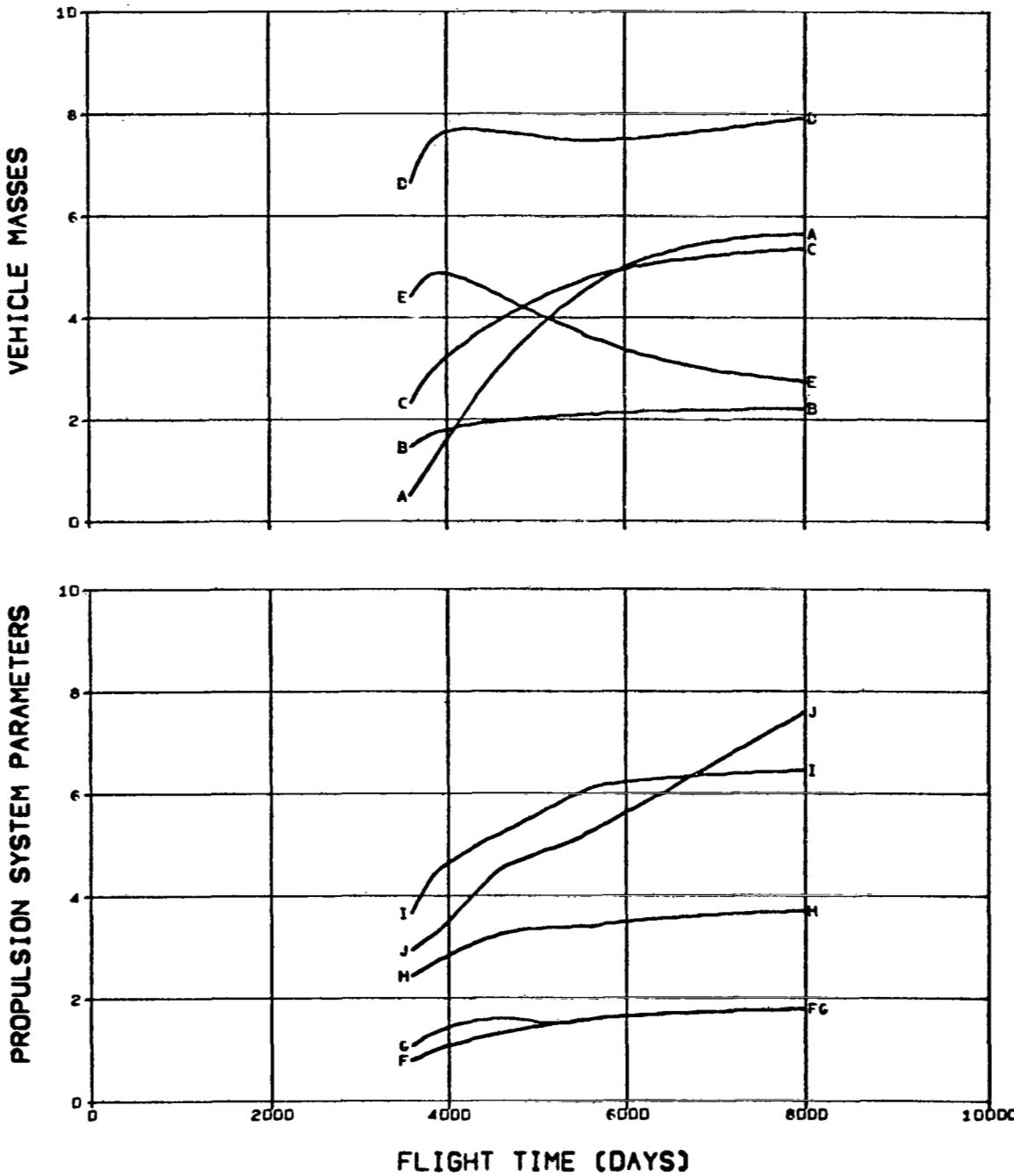


FIG. 7.5.4 URANUS MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

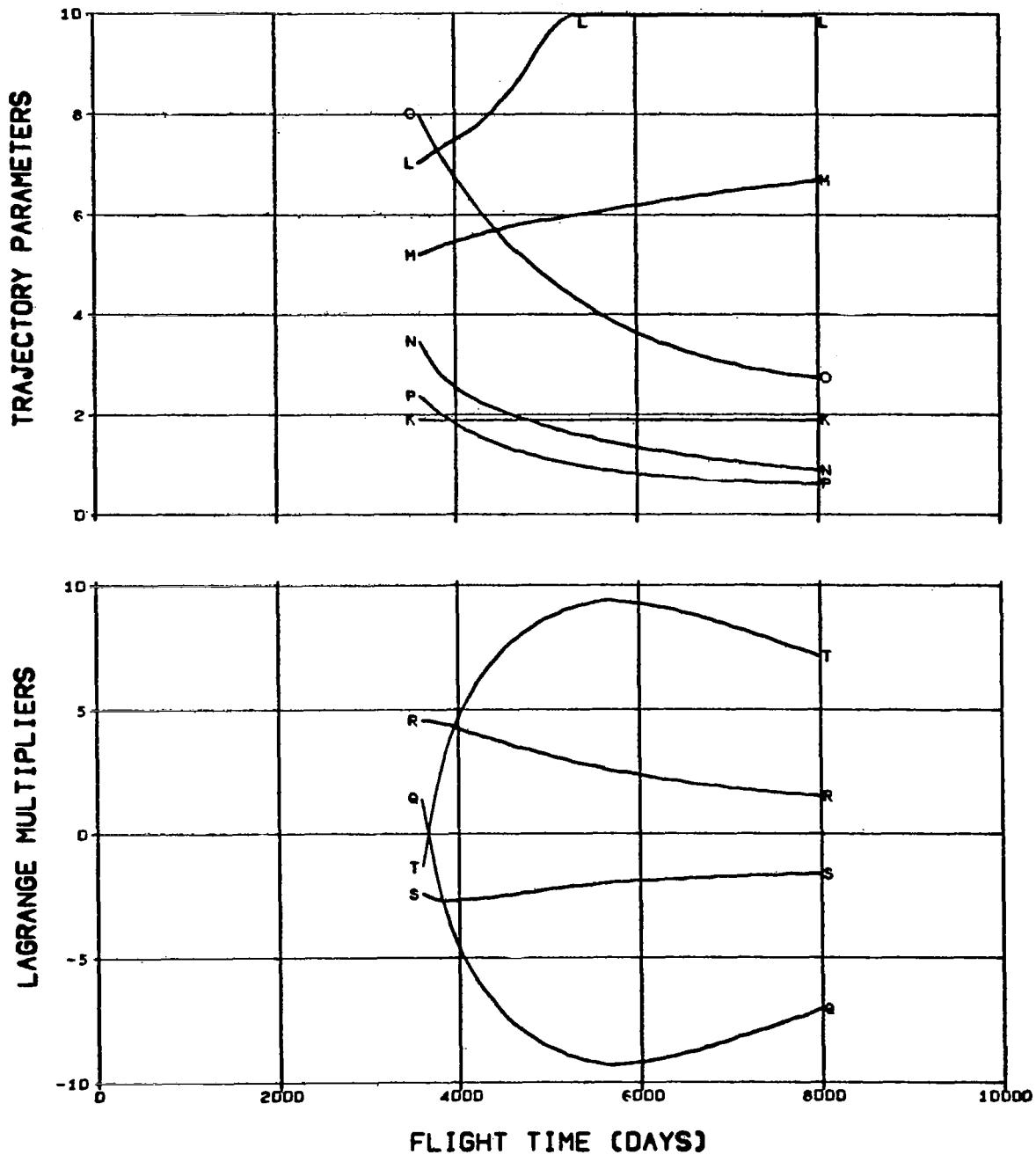


FIG. 7.5.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/1000

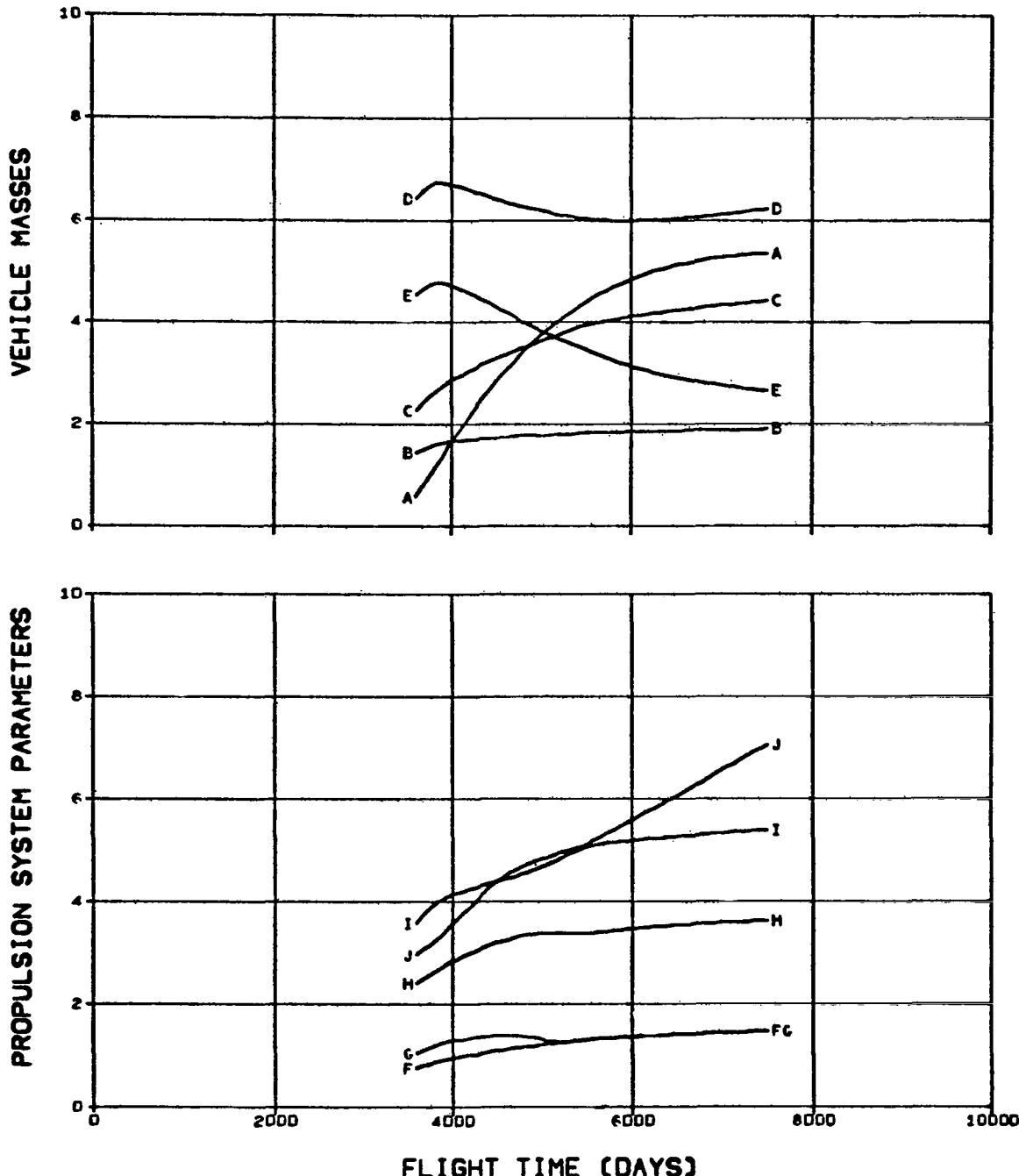


FIG. 7.5.5 URANUS MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPARALLEL TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

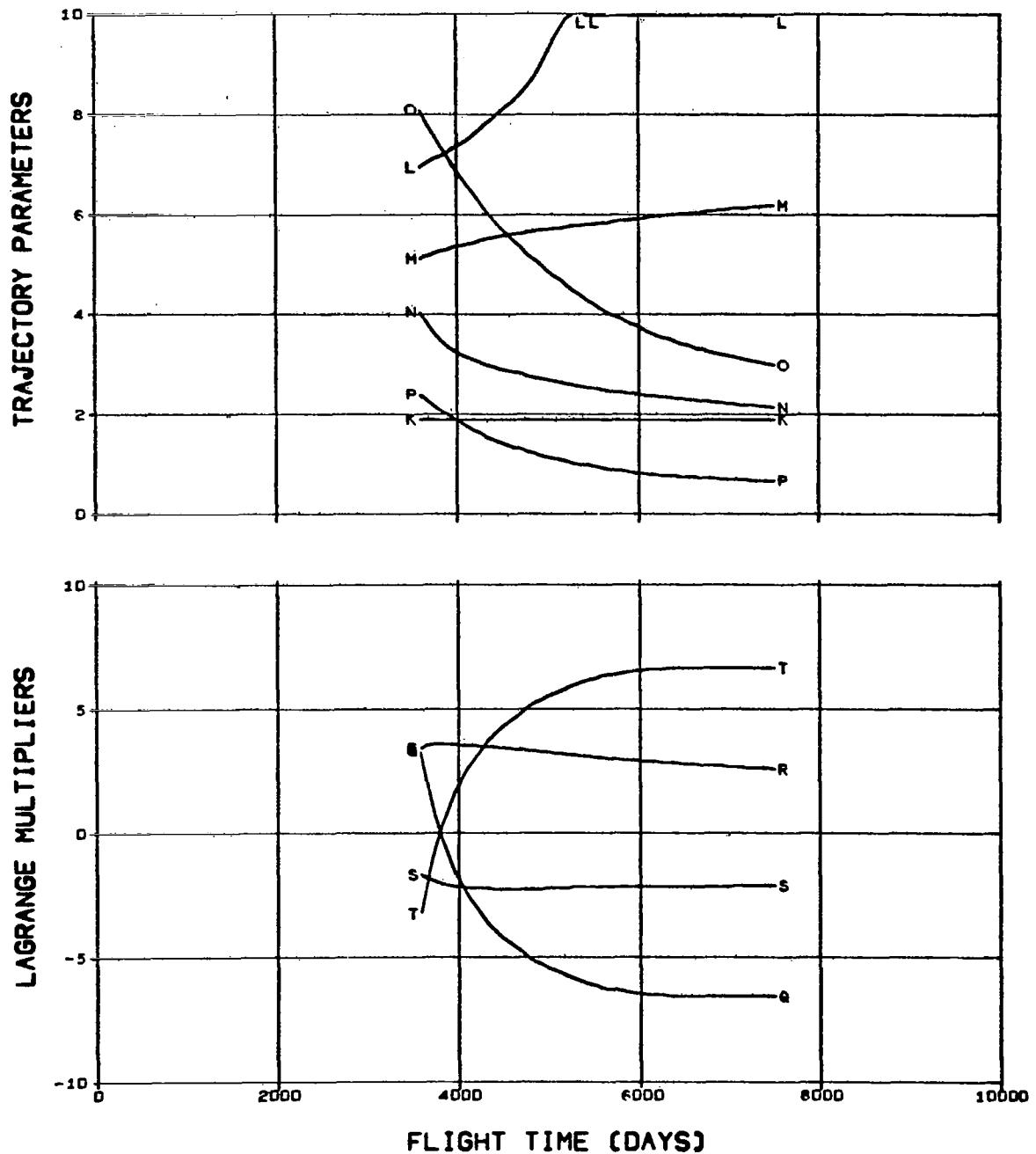


FIG. 7.5.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

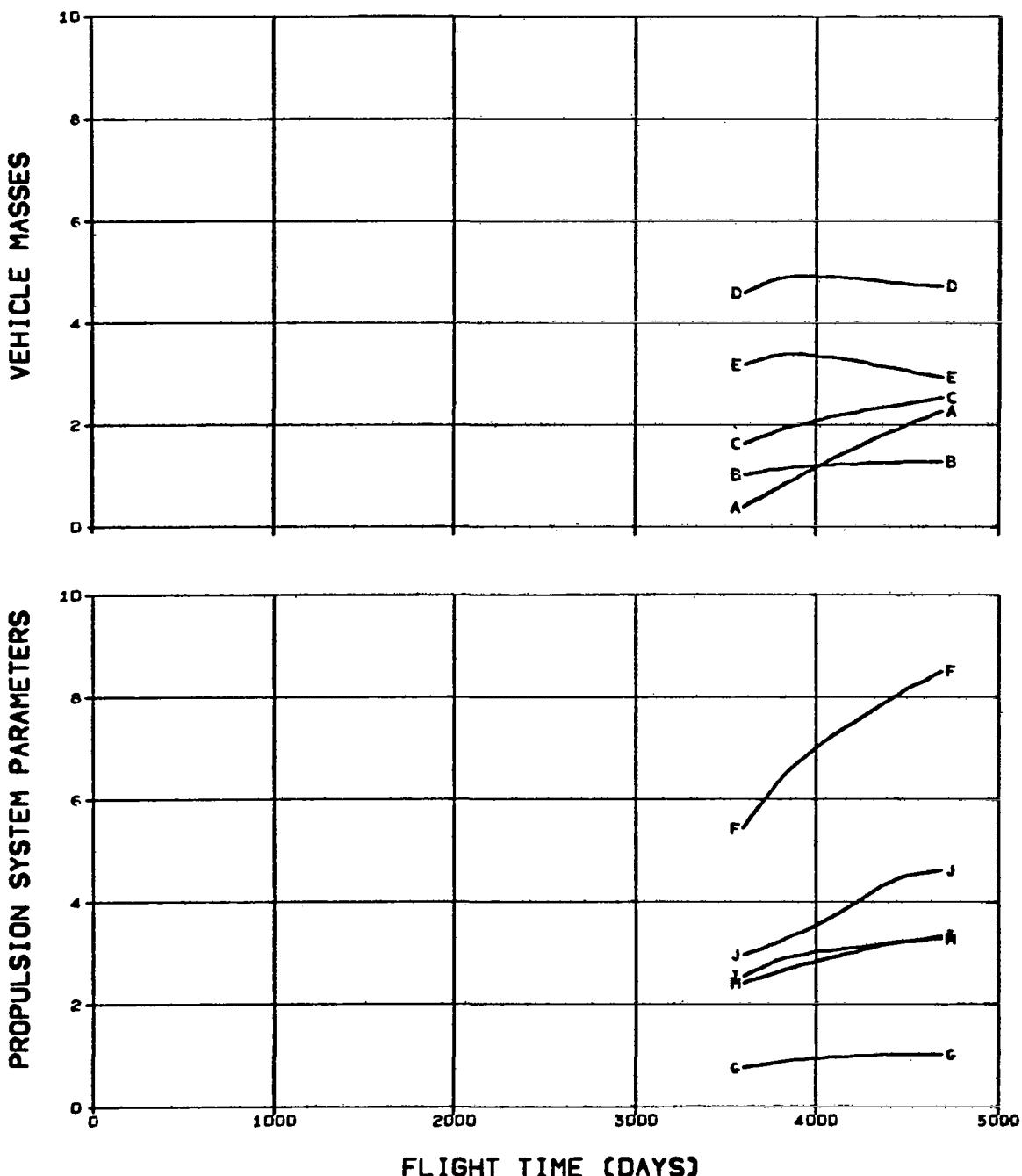


FIG. 7.5.6 URANUS MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

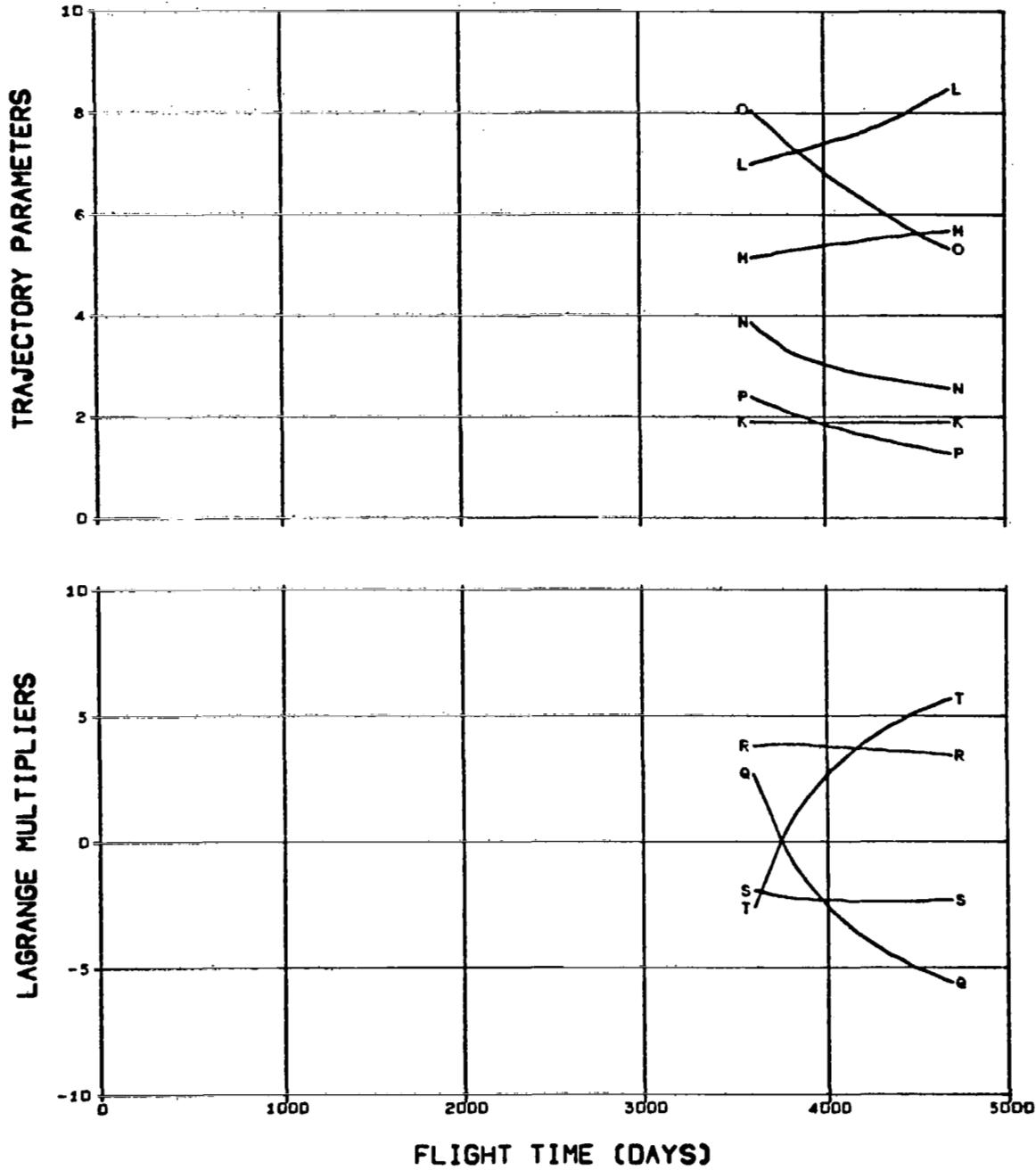


FIG. 7.5.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

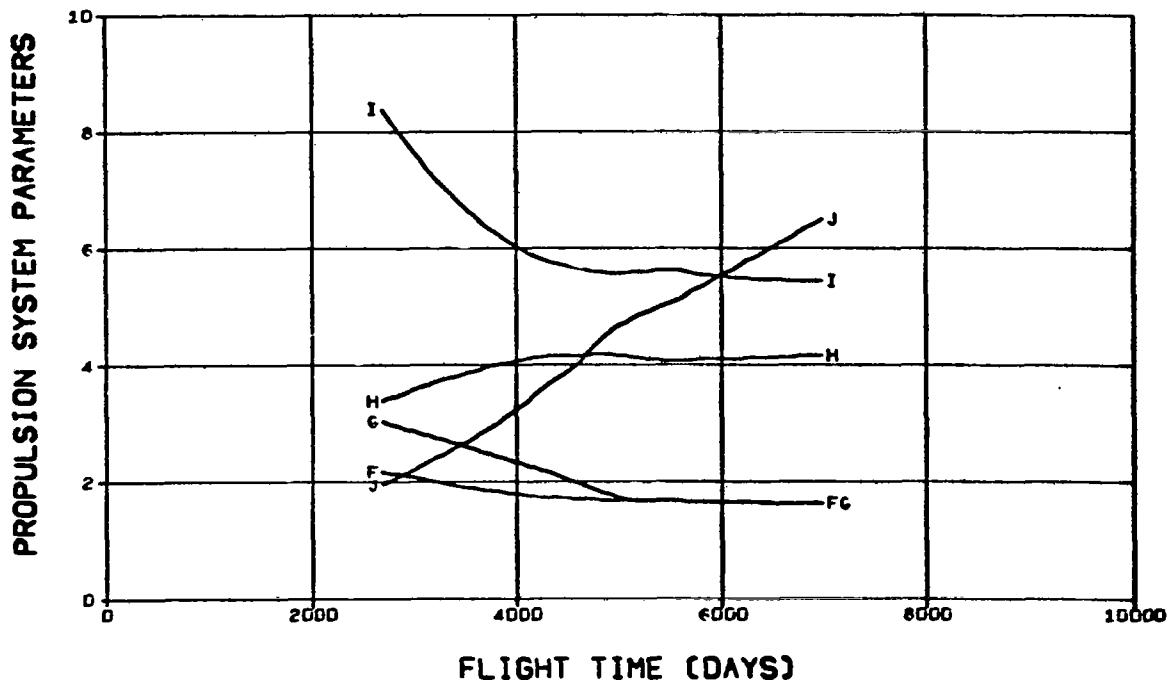
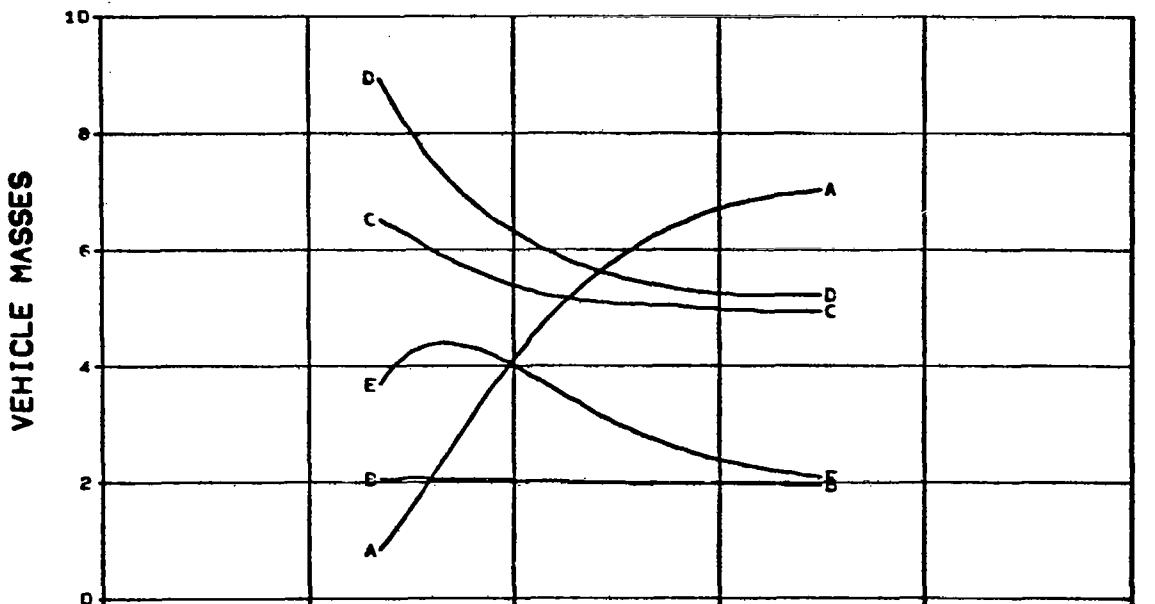


FIG. 7.6.1 URANUS MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-3

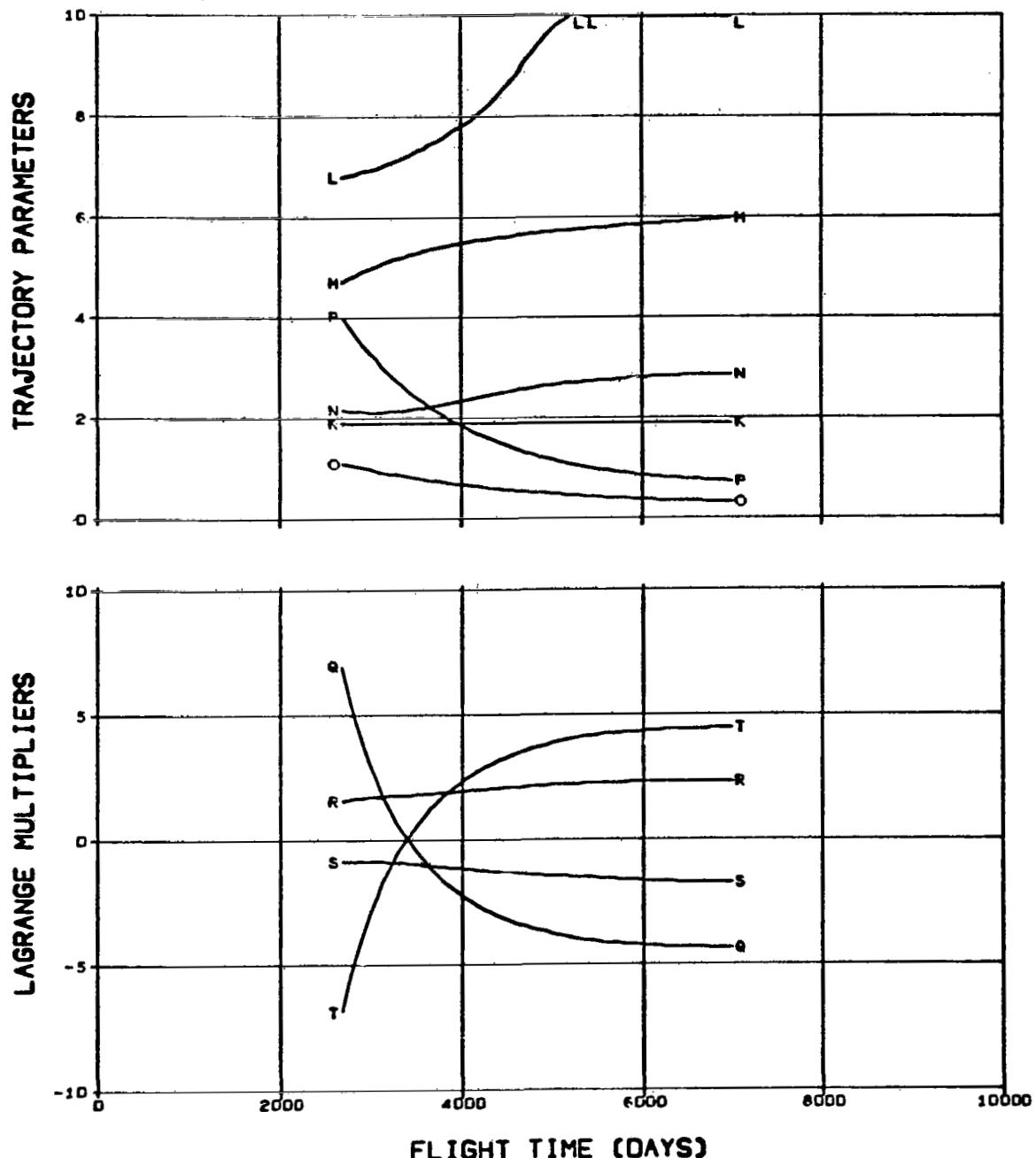
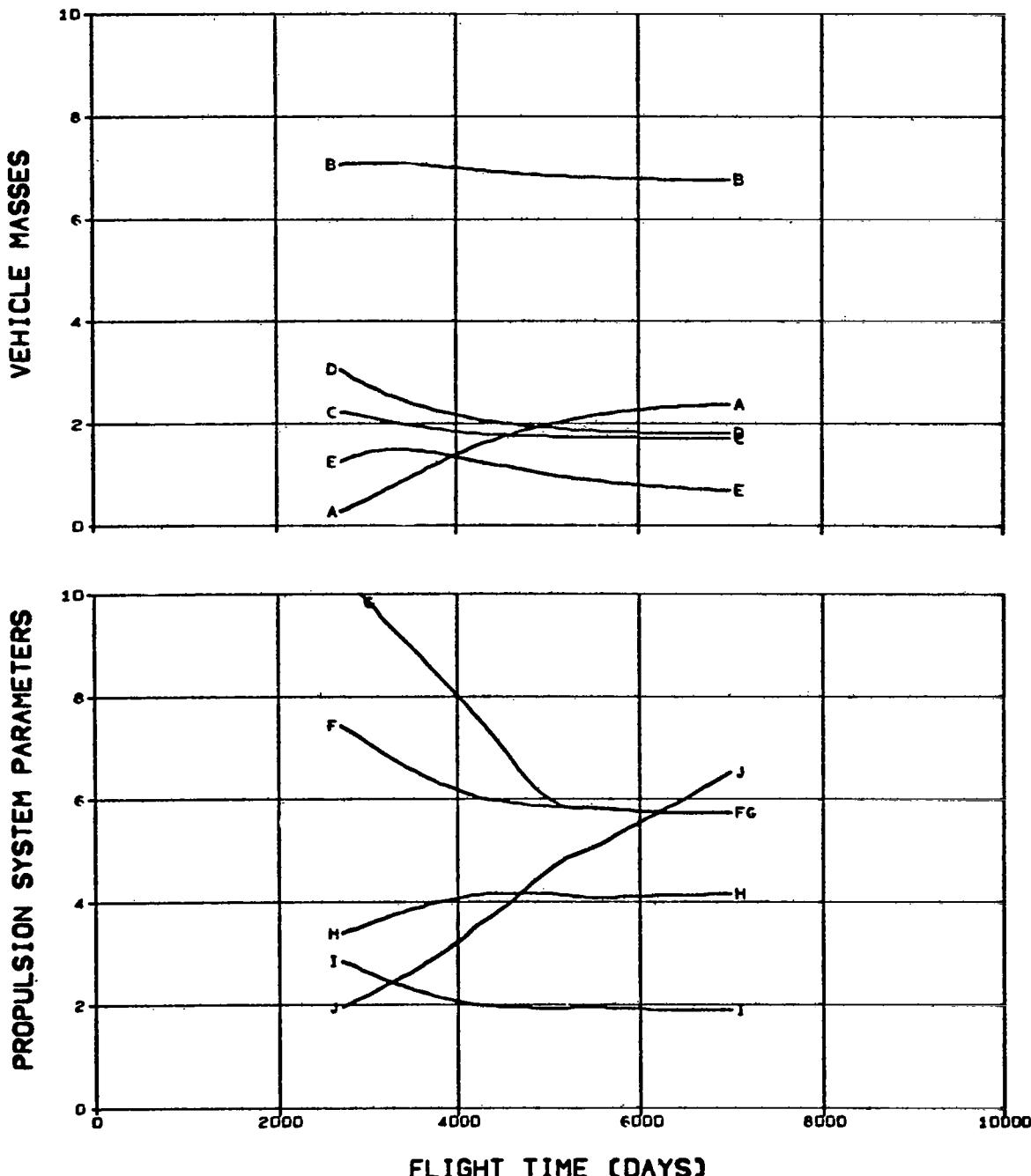


FIG. 7.6.1 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/1000	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/1000	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/1000	J PROPULSION TIME (DAYS)/1000



**FIG. 7.6.2 URANUS MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-2

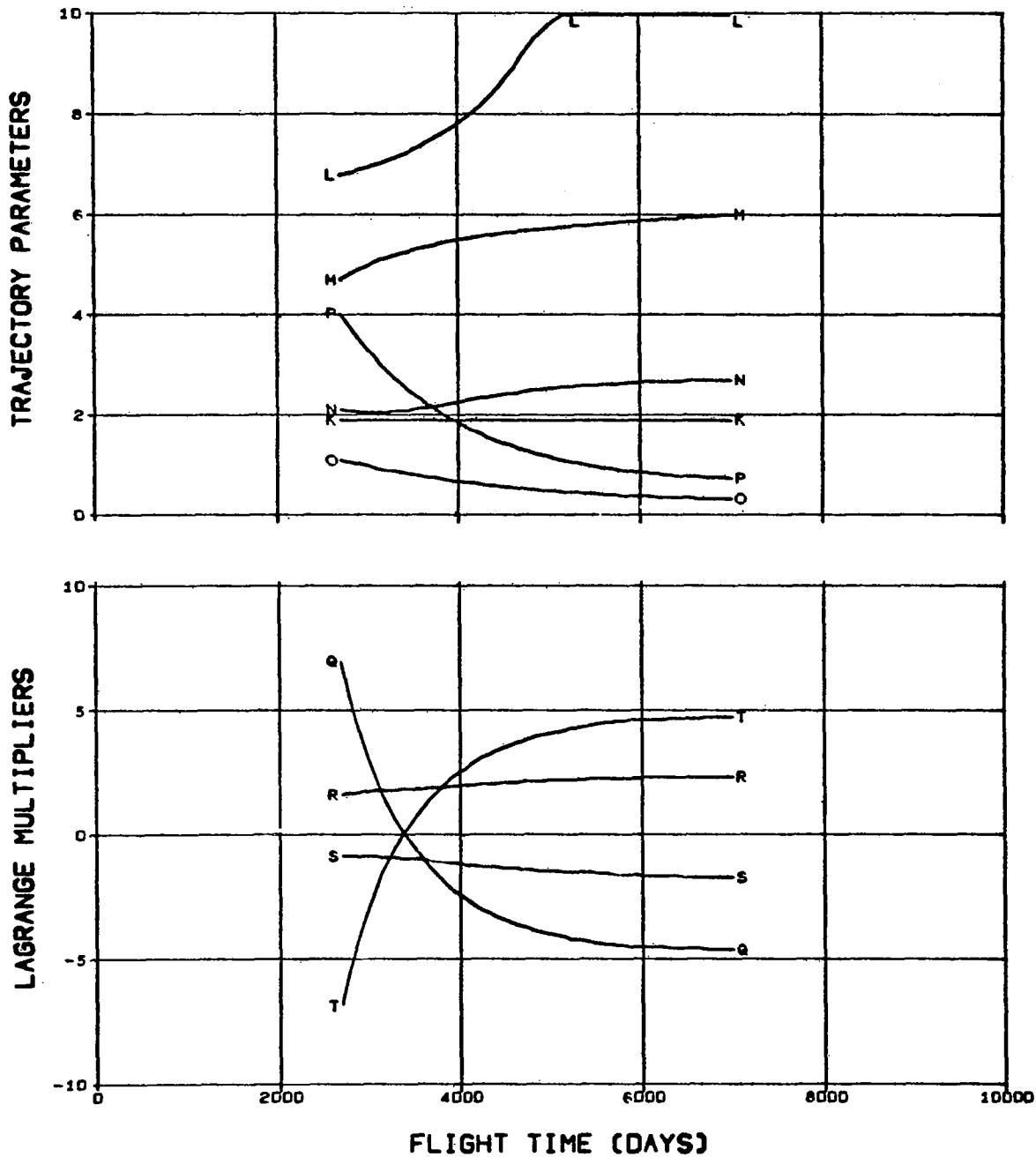


FIG. 7.6.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

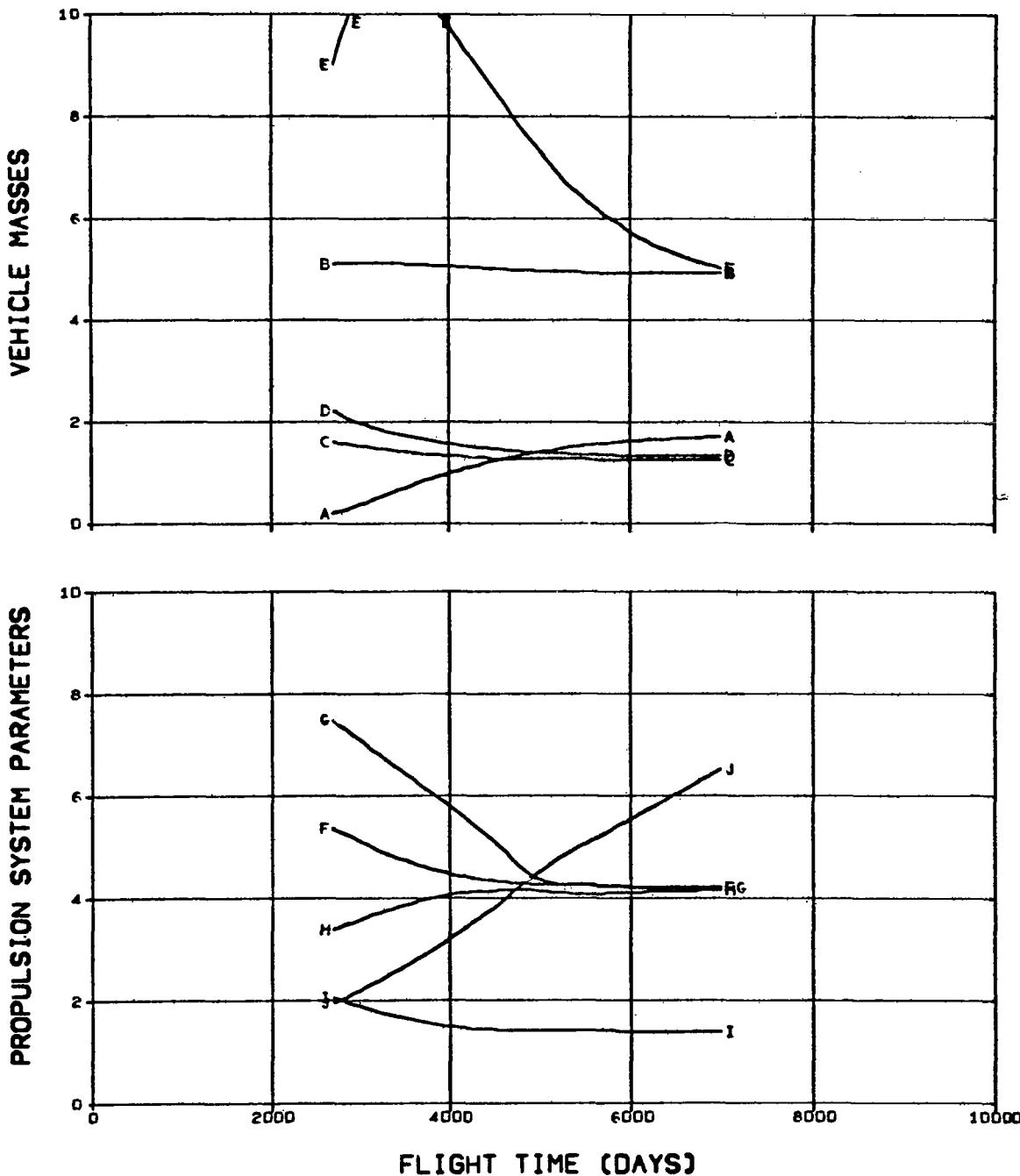


FIG. 7.6.3 URANUS MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

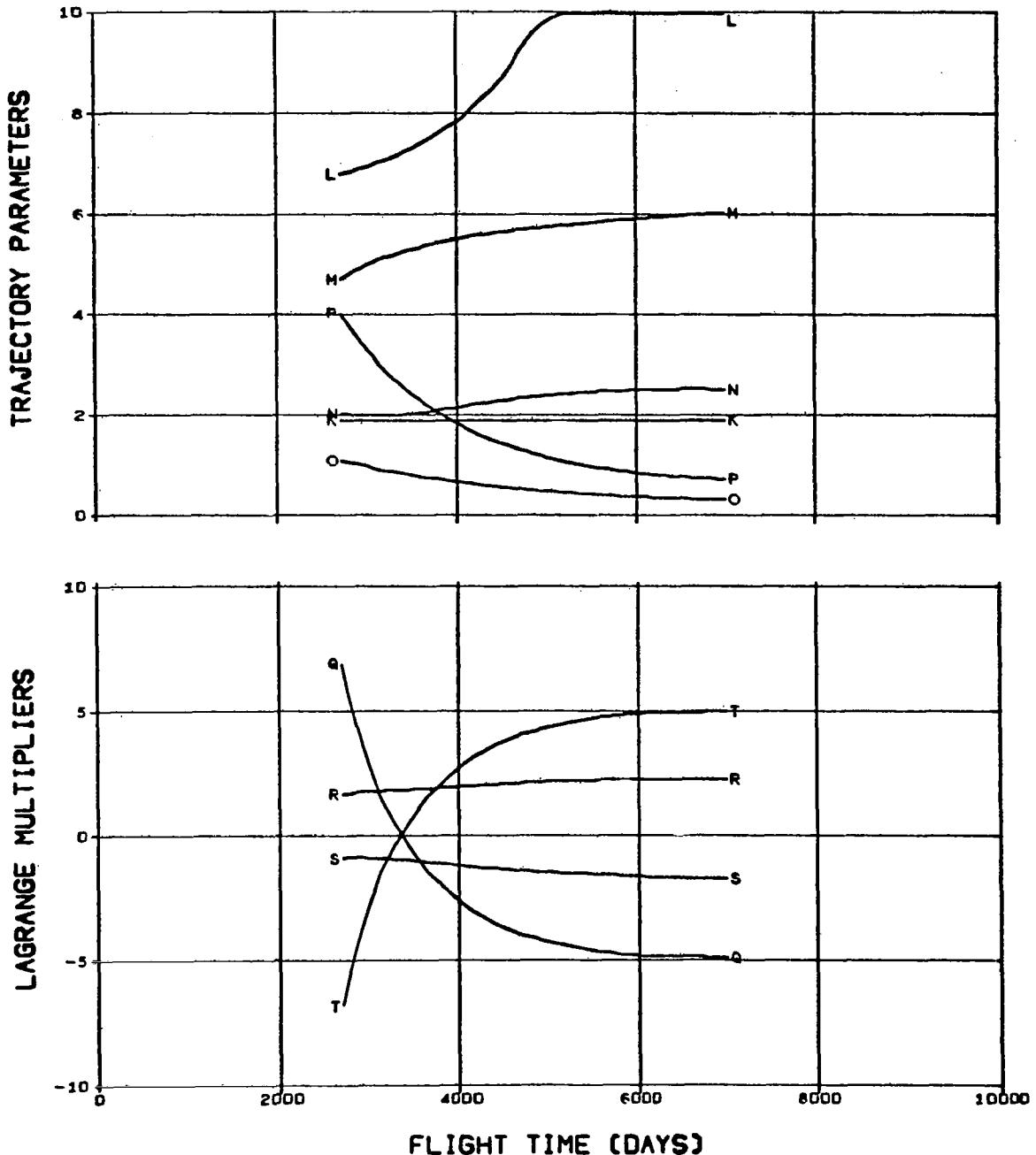


FIG. 7.6.3 (CONCLUDED)

A. NET SPACECRAFT MASS (KG)/100	F. POWER AT 1 AU (KW)/10
B. INITIAL SPACECRAFT MASS (KG)/1000	G. MAXIMUM POWER (KW)/10
C. PROPULSION SYSTEM MASS (KG)/100	H. JET EXHAUST SPEED (M/SEC)/10000
D. PROPELLANT MASS (KG)/100	I. THRUST AT 1 AU (N)/1.0DE-1
E. RETRO PROPELLANT MASS (KG)/100	J. PROPULSION TIME (DAYS)/1000

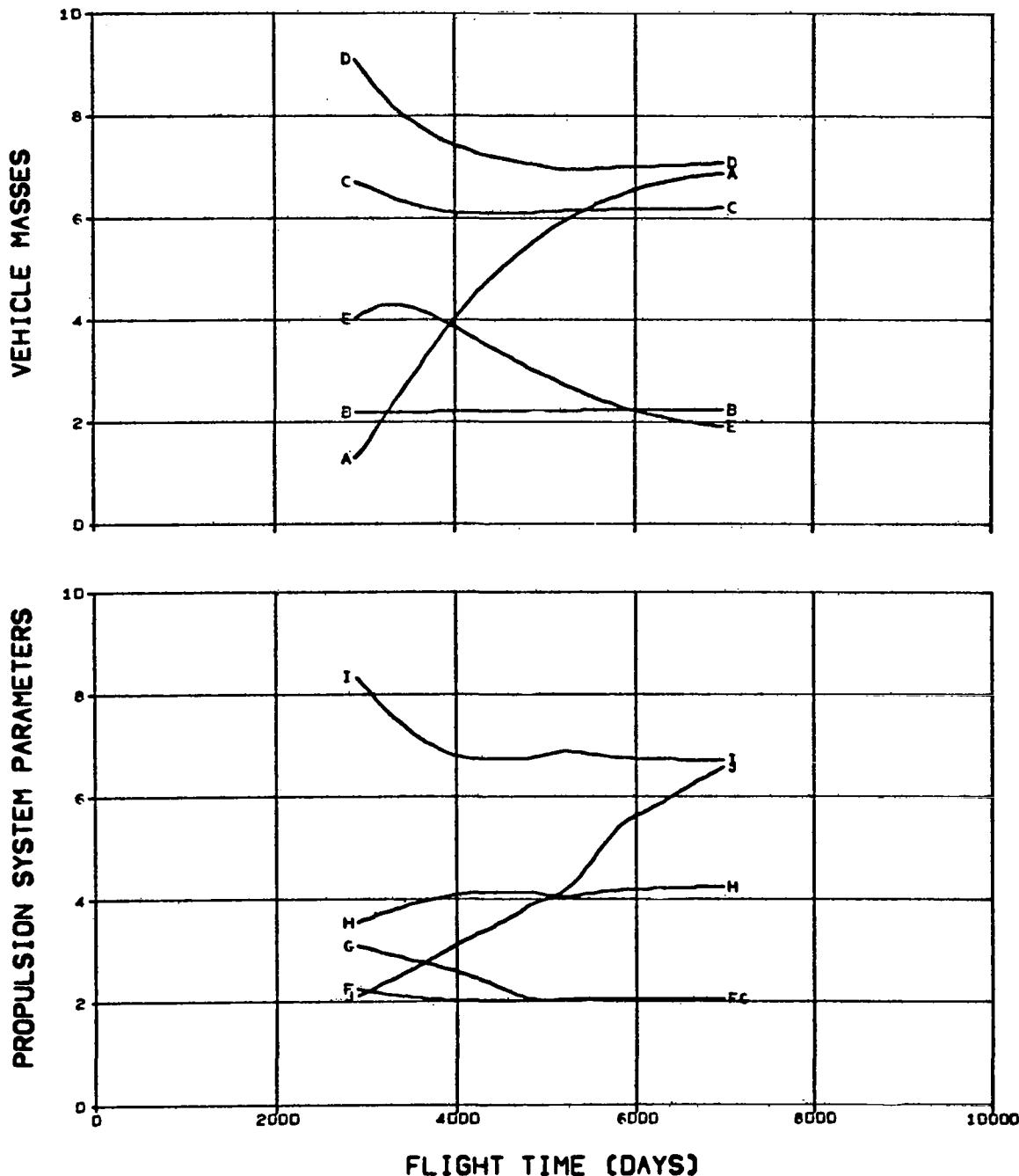


FIG. 7.6.4 URANUS MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/2000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

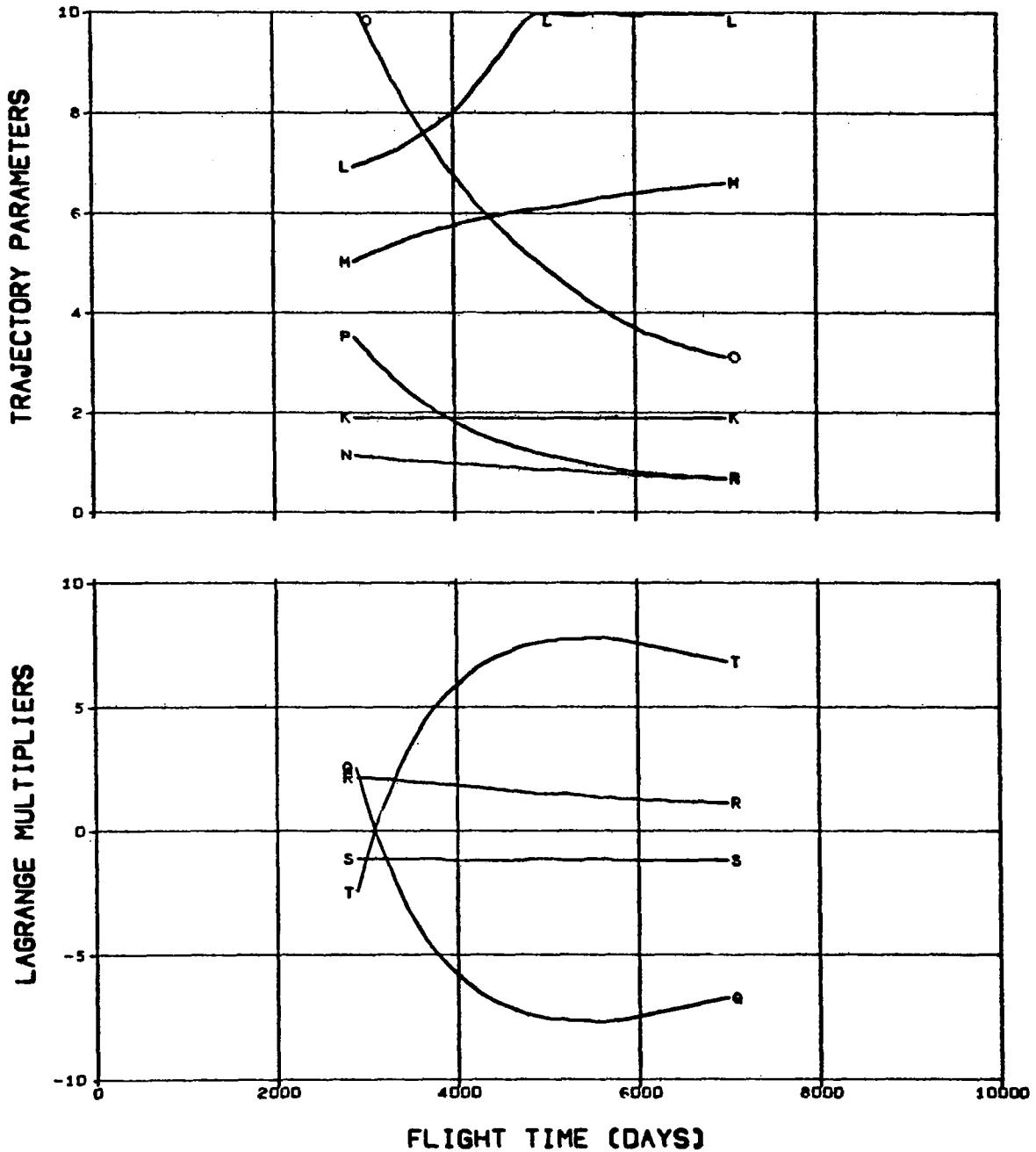


FIG. 7.6.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.DDE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLION TIME (DAYS)/1000

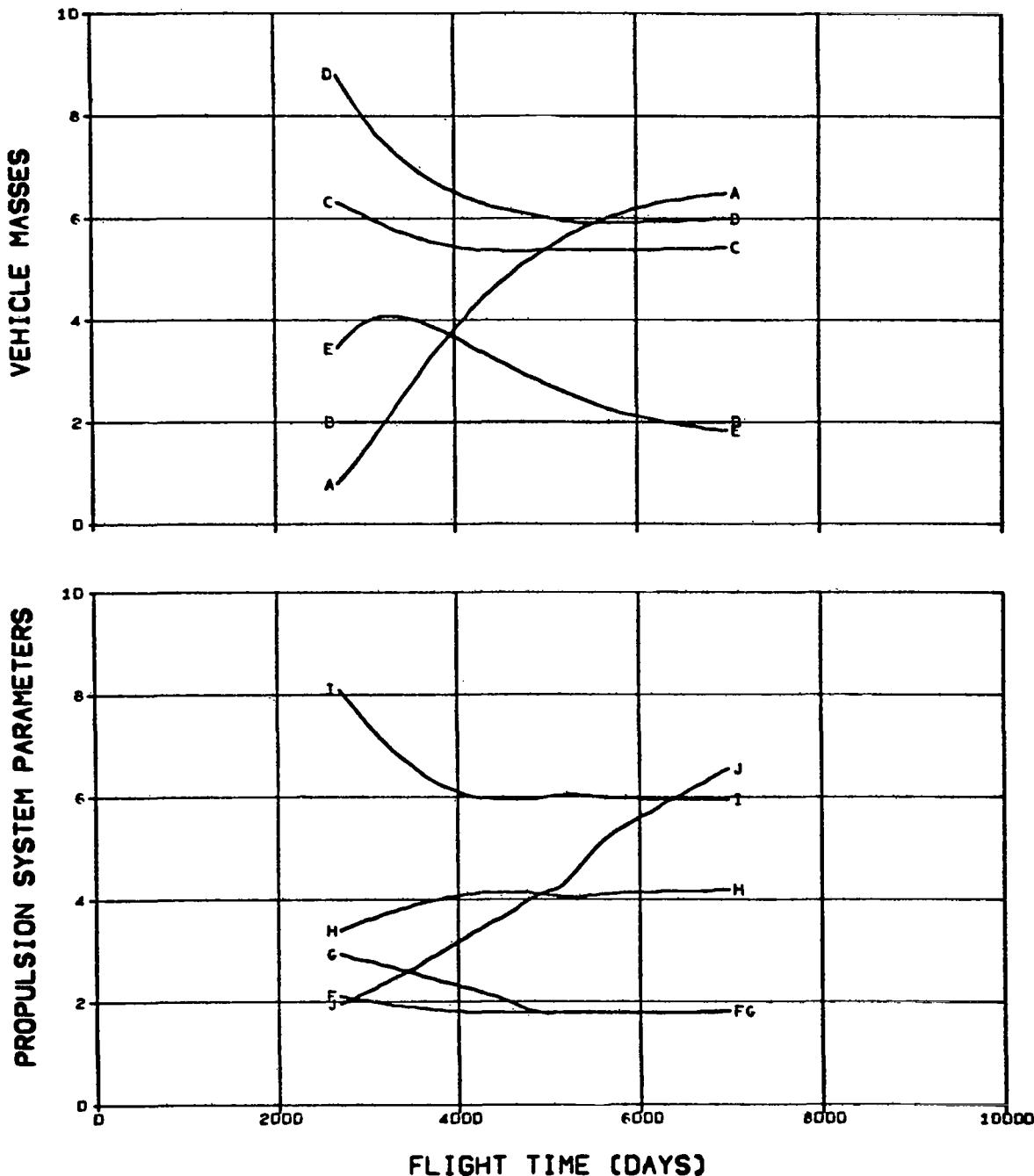


FIG. 7.6.5 URANUS MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

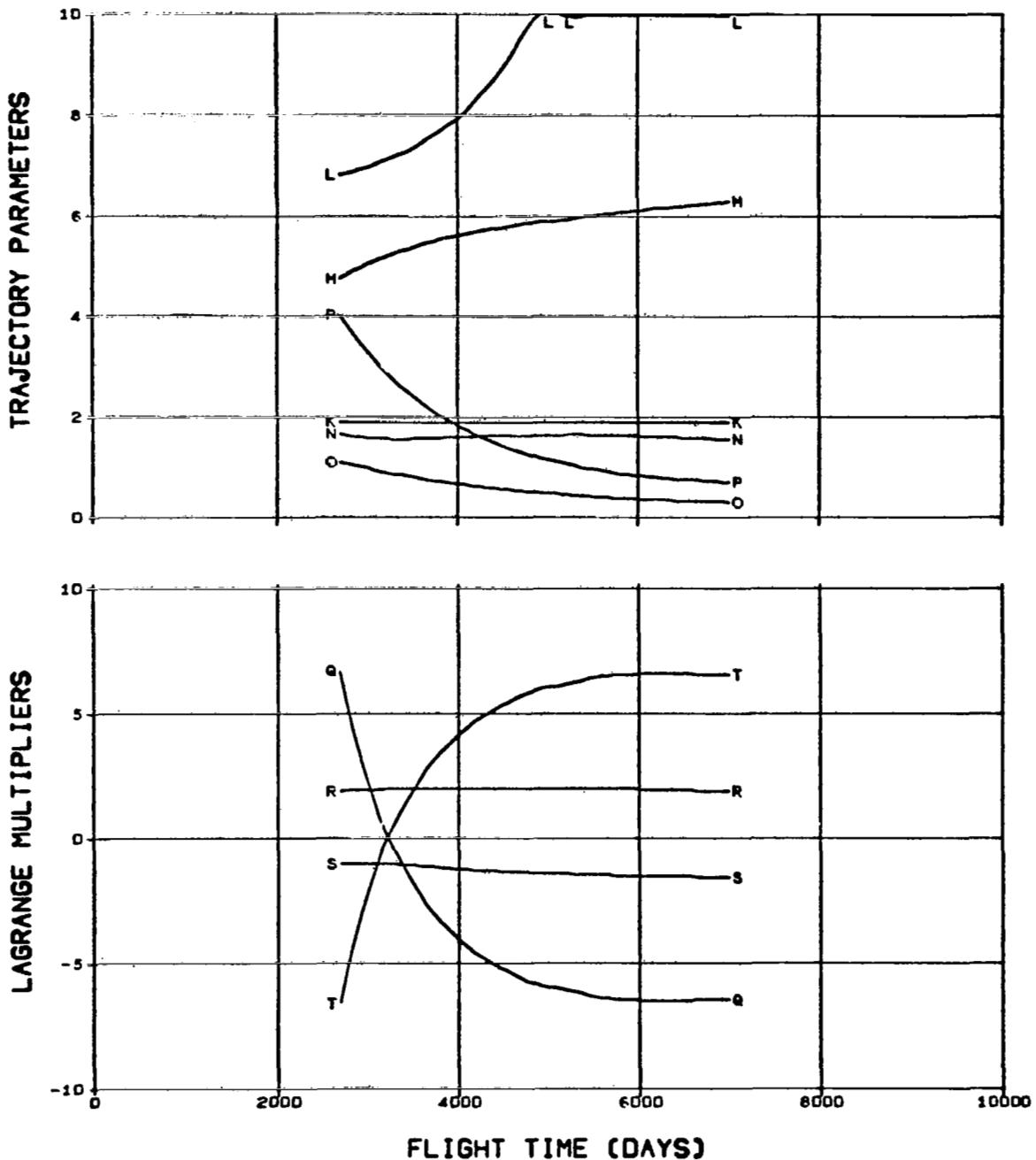


FIG. 7.6.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

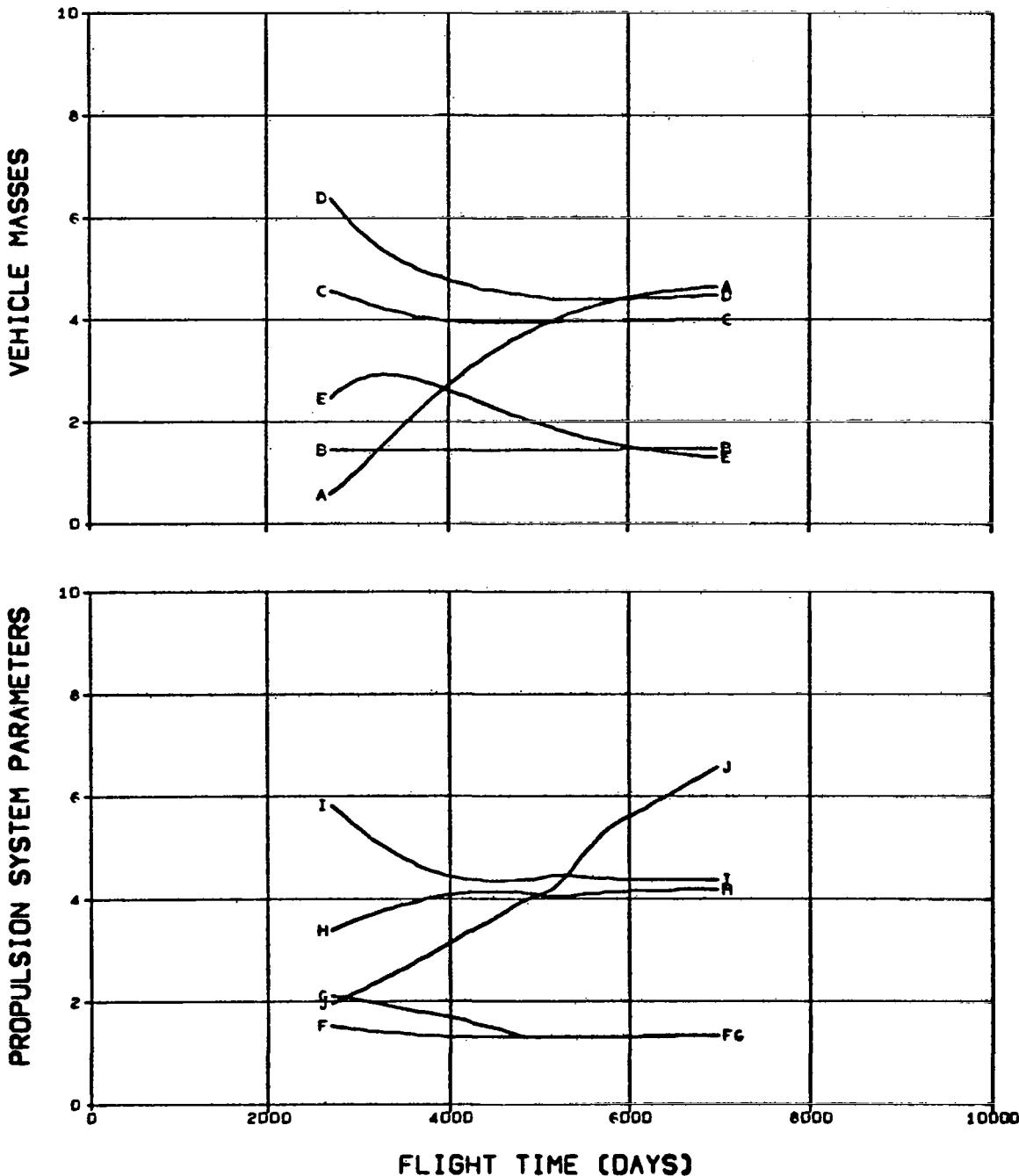


FIG. 7.6.6 URANUS MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

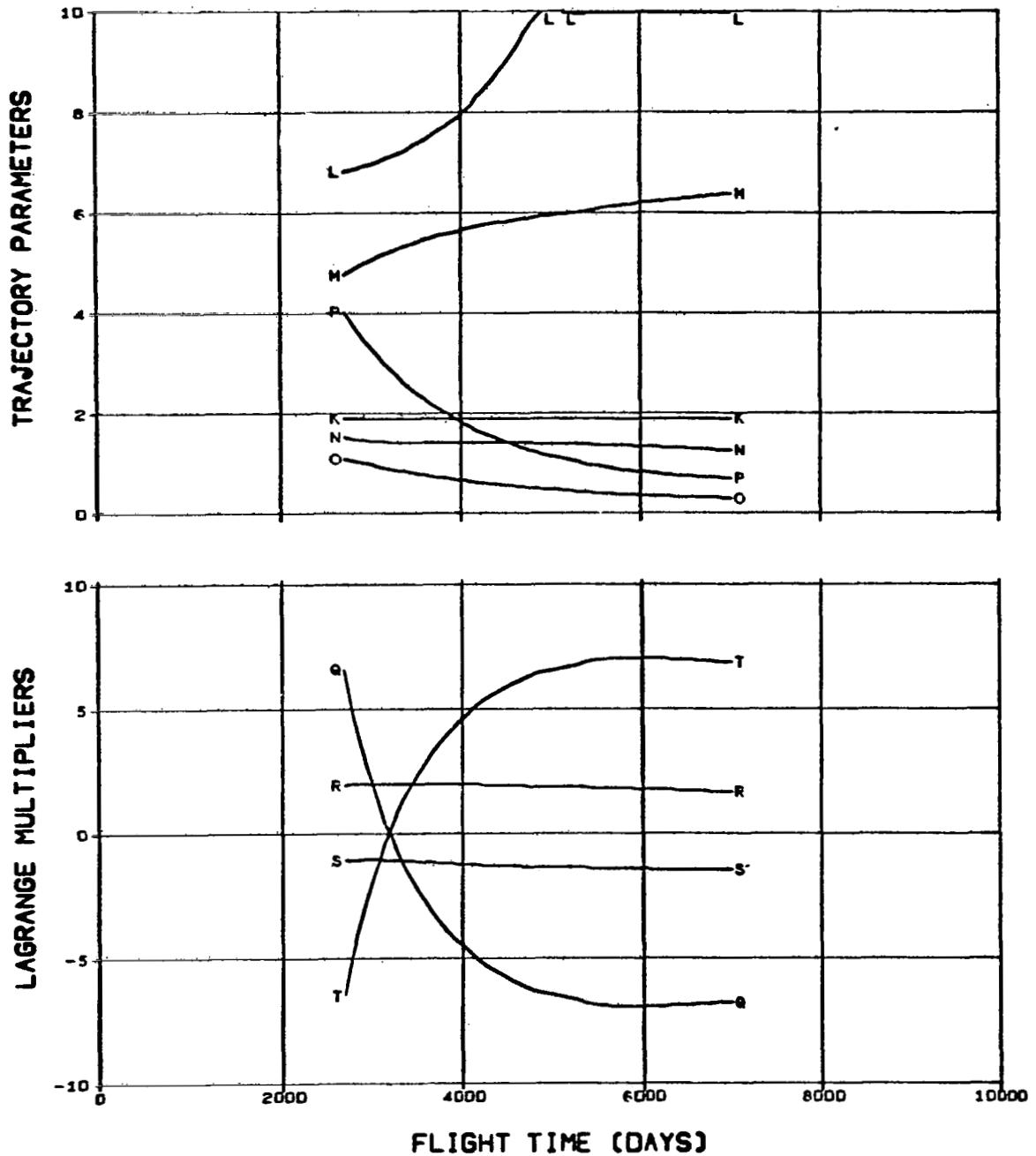


FIG. 7.6.6 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/1000
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/1000
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)
 J PROPULSION TIME (DAYS)/1000

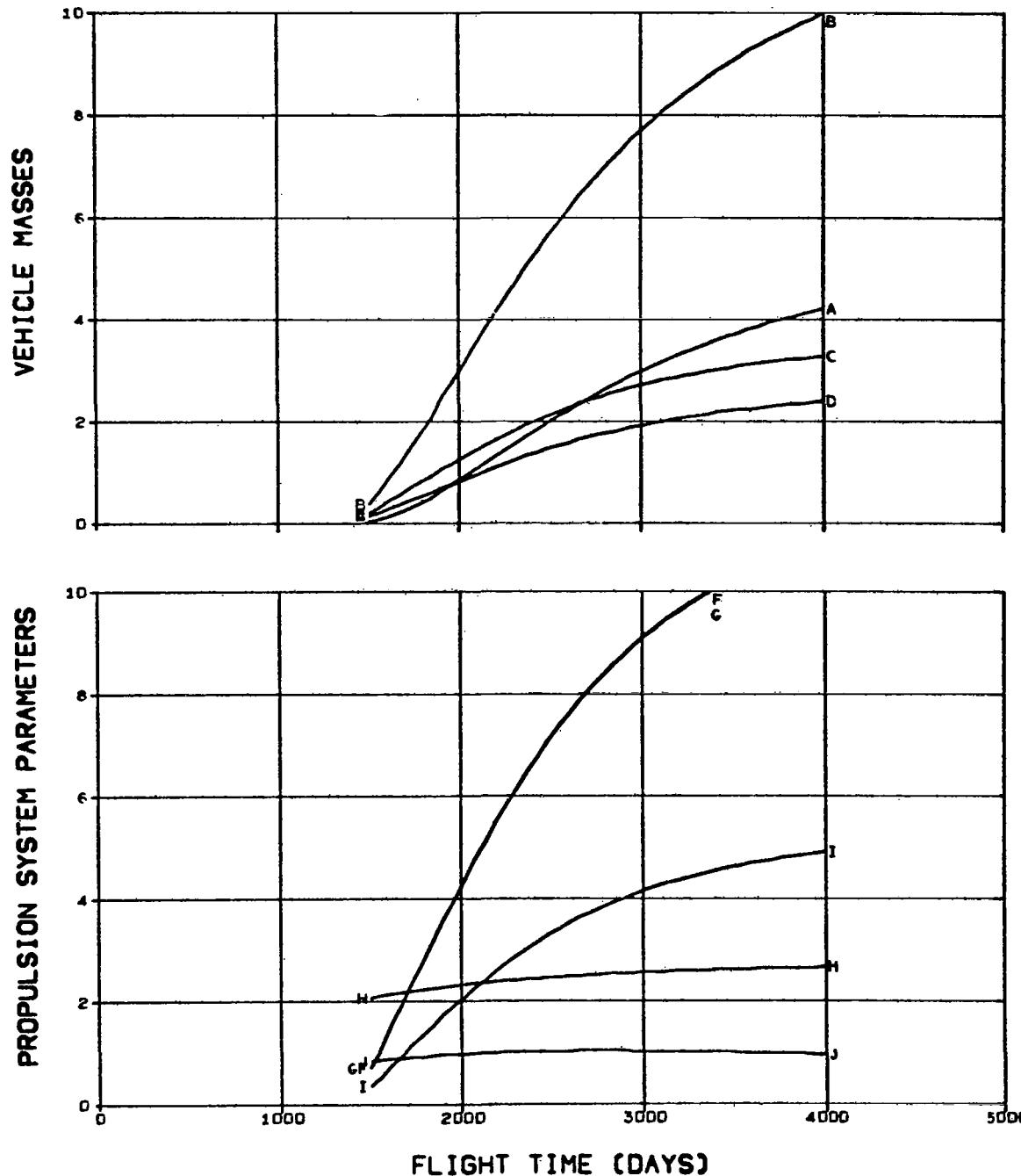


FIG. 8.1.1 NEPTUNE MODE A FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

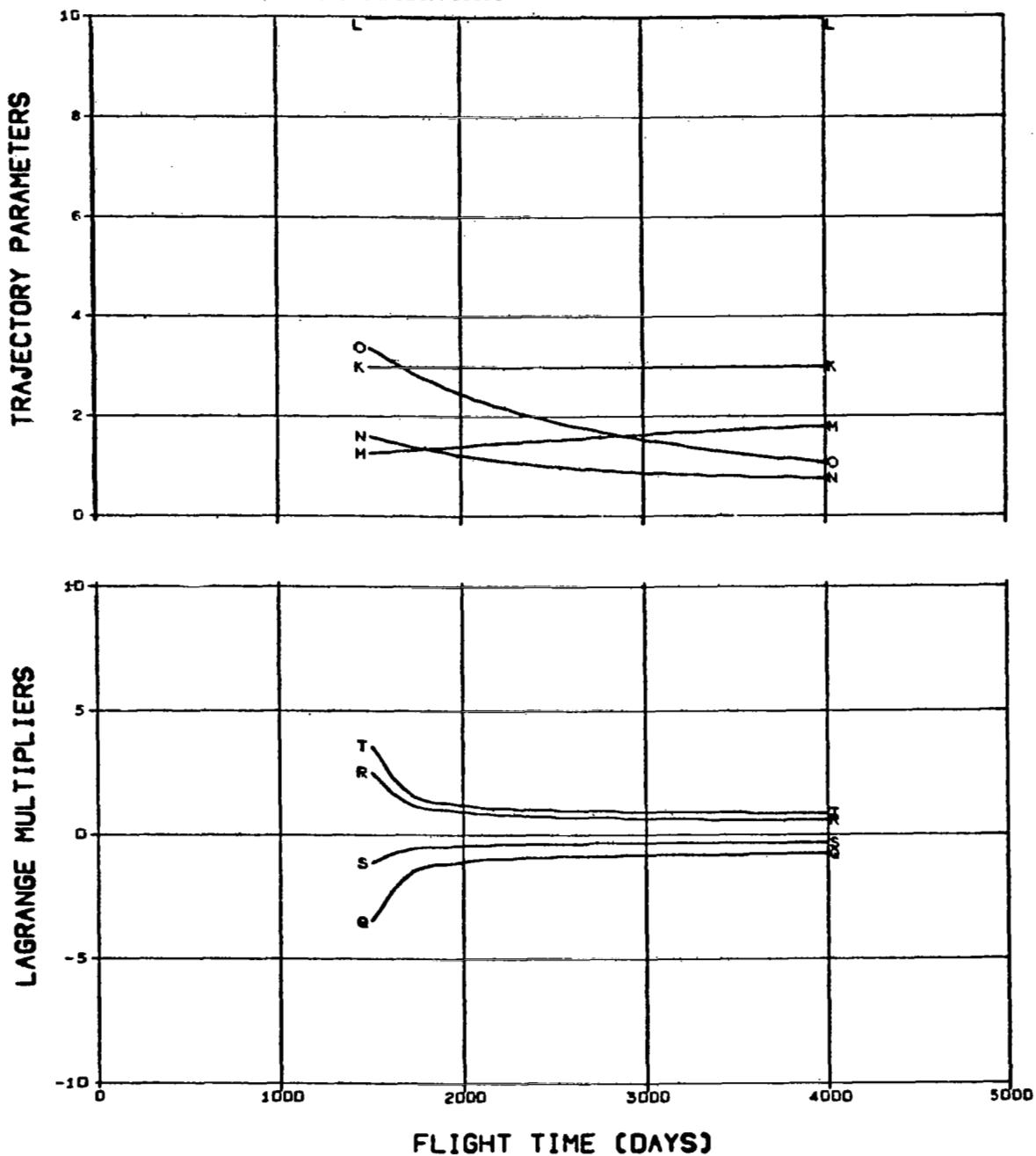


FIG. 8.1.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/1000

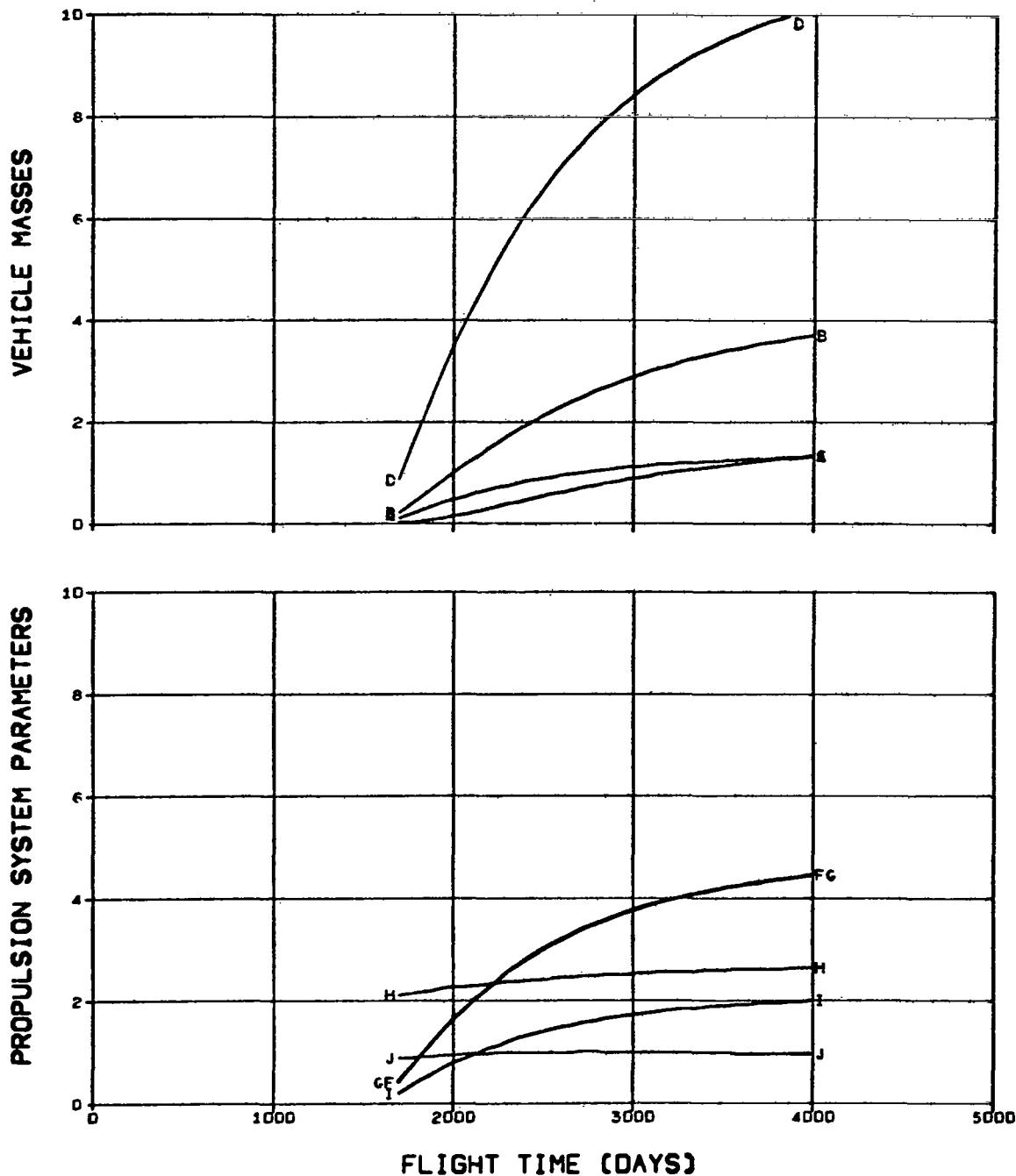


FIG. 8.1.2 NEPTUNE MODE A FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/10000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

Q X-COMPONENT OF PRIMER
 R Y-COMPONENT OF PRIMER/10
 S X-COMPONENT OF PRIMER DERIVATIVE/10
 T Y-COMPONENT OF PRIMER DERIVATIVE

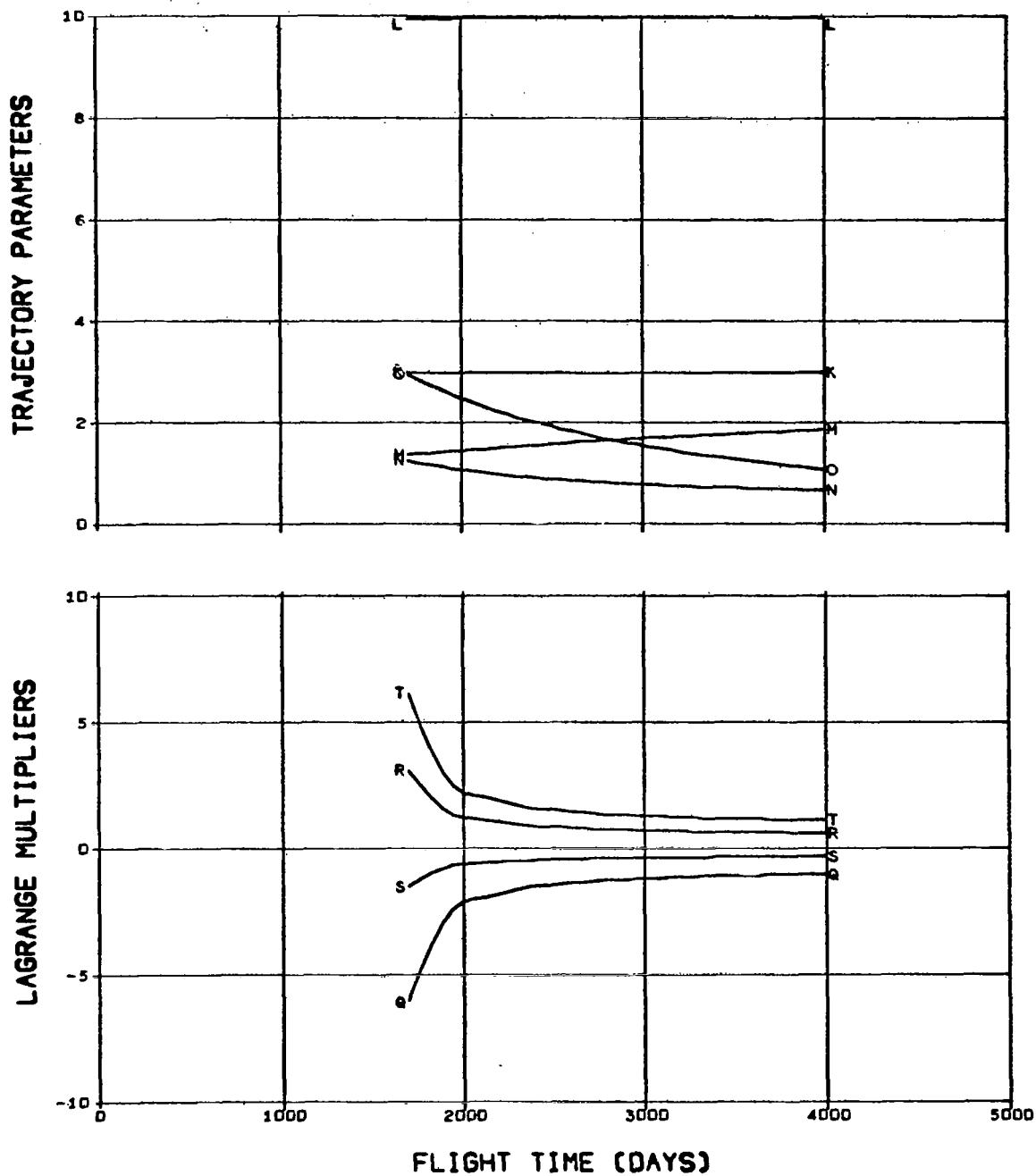


FIG. 8.1.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLANT MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
		J	PROPULSION TIME (DAYS)/1000

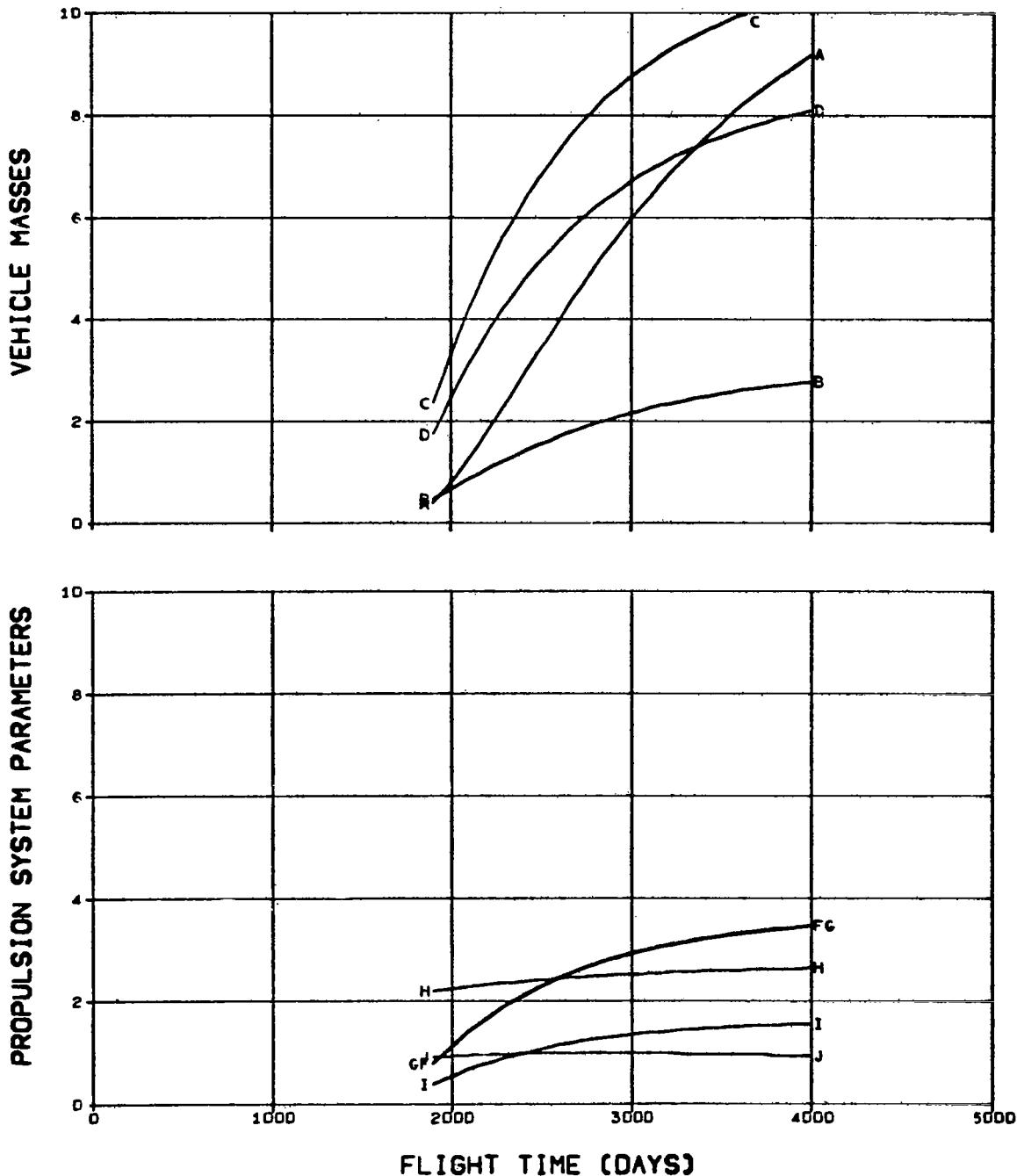


FIG. 8.1.3 NEPTUNE MODE A FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

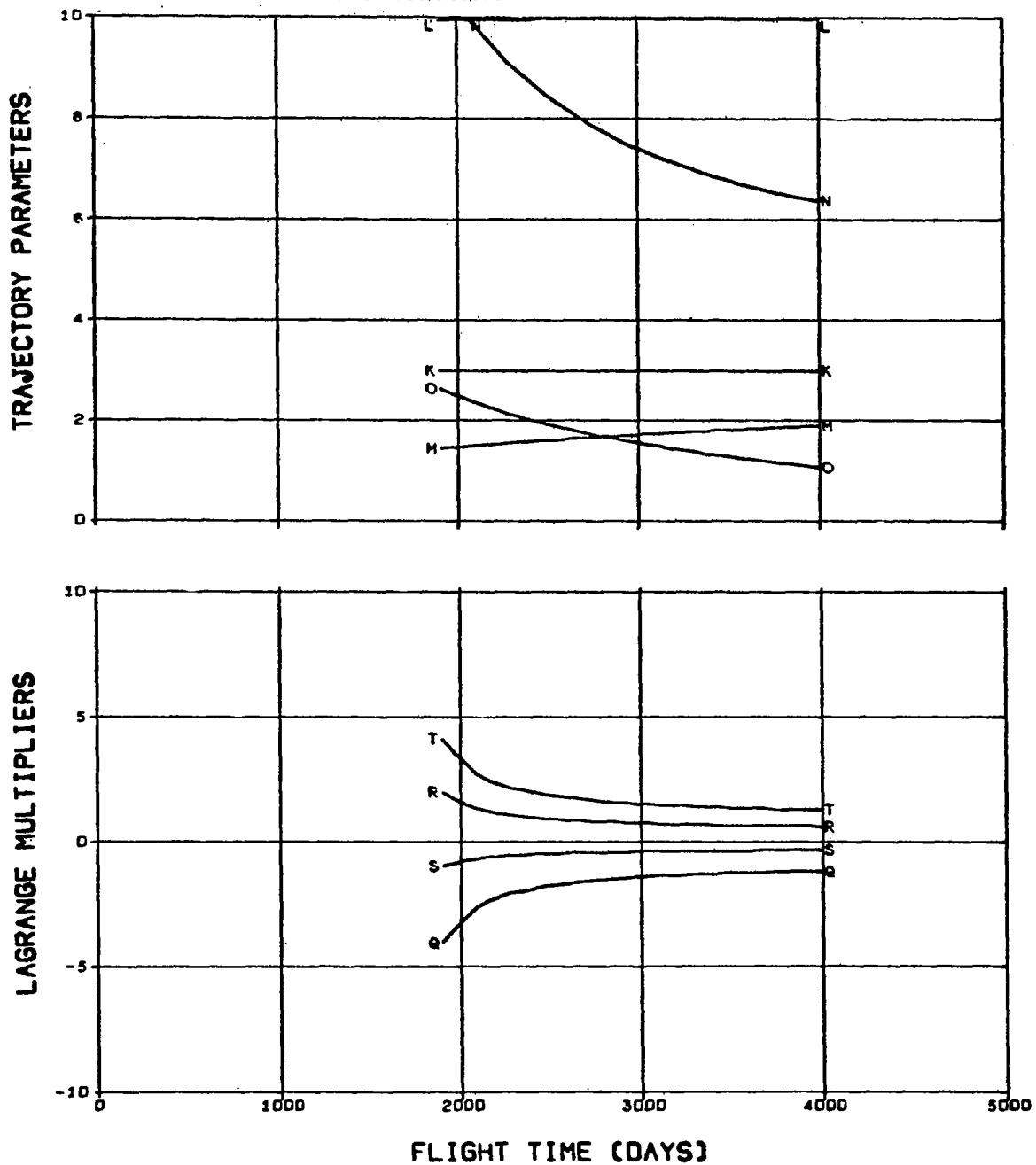


FIG. 8.1.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
		J	PROPELLION TIME (DAYS)/100

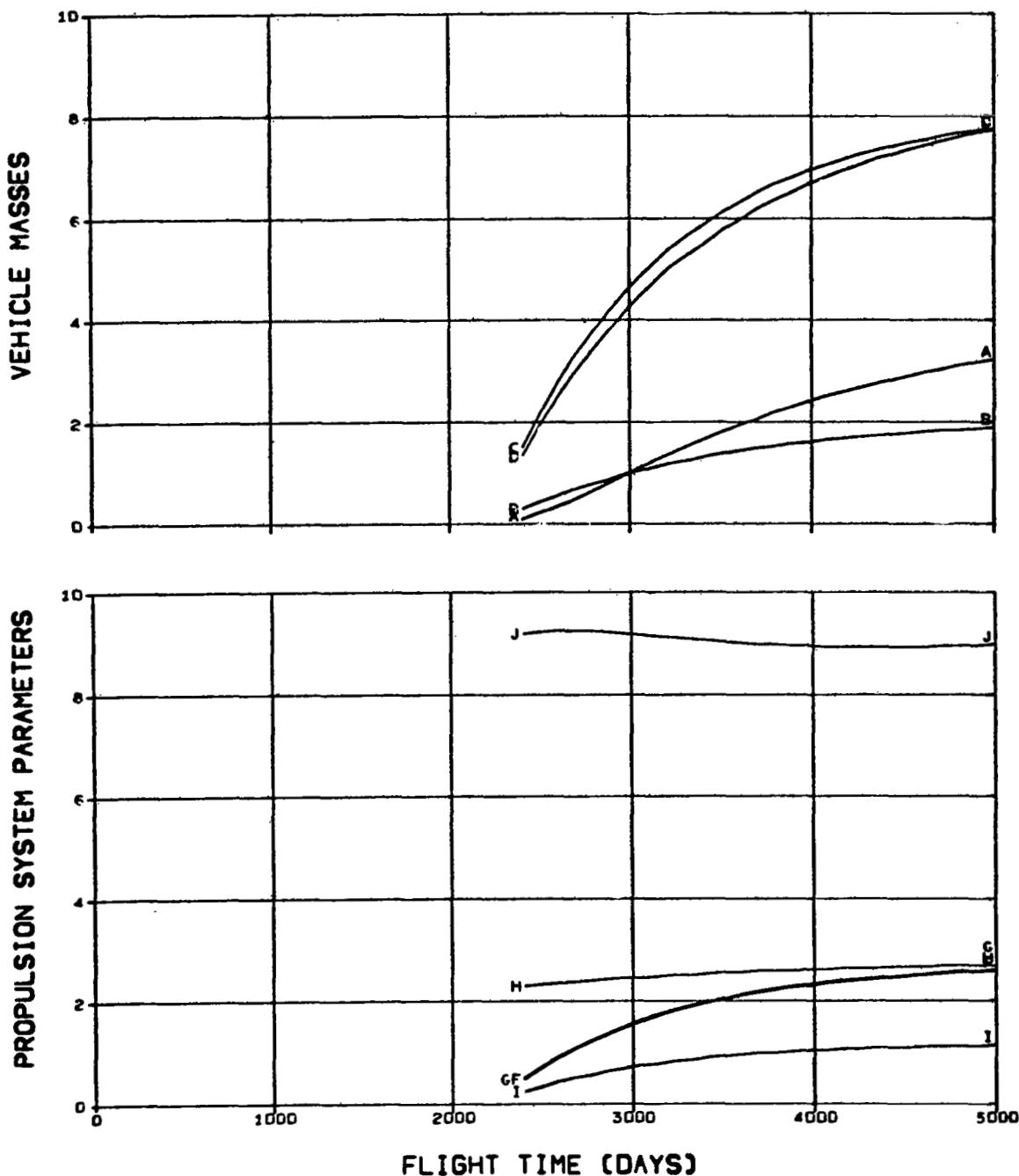


FIG. 8.1.4 NEPTUNE MODE A FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

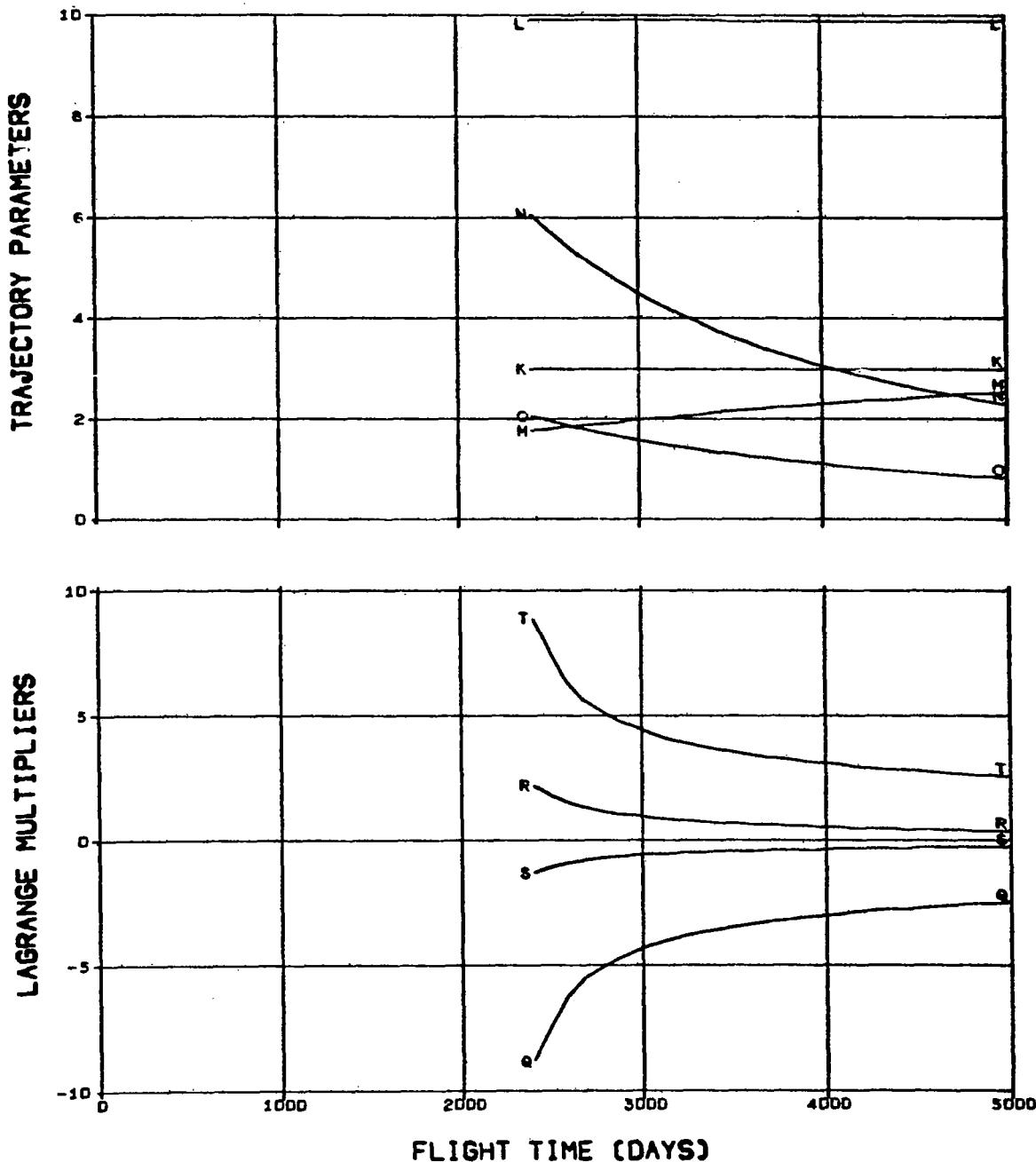


FIG. 8.1.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0E-1
 J PROPULSION TIME (DAYS)/100

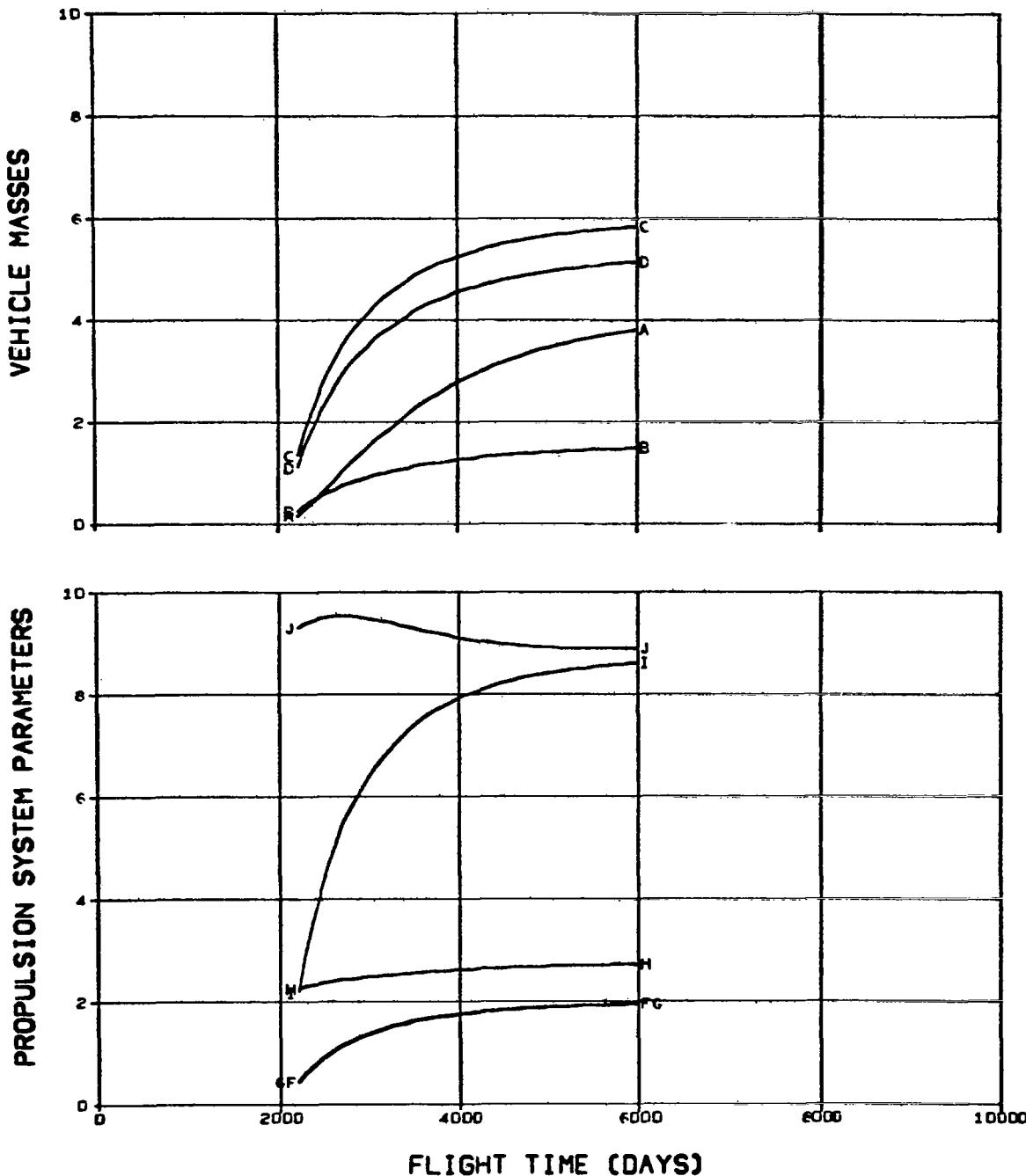


FIG. 8.1.5 NEPTUNE MODE A FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 R Y-COMPONENT OF PRIMER/10
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE/10
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

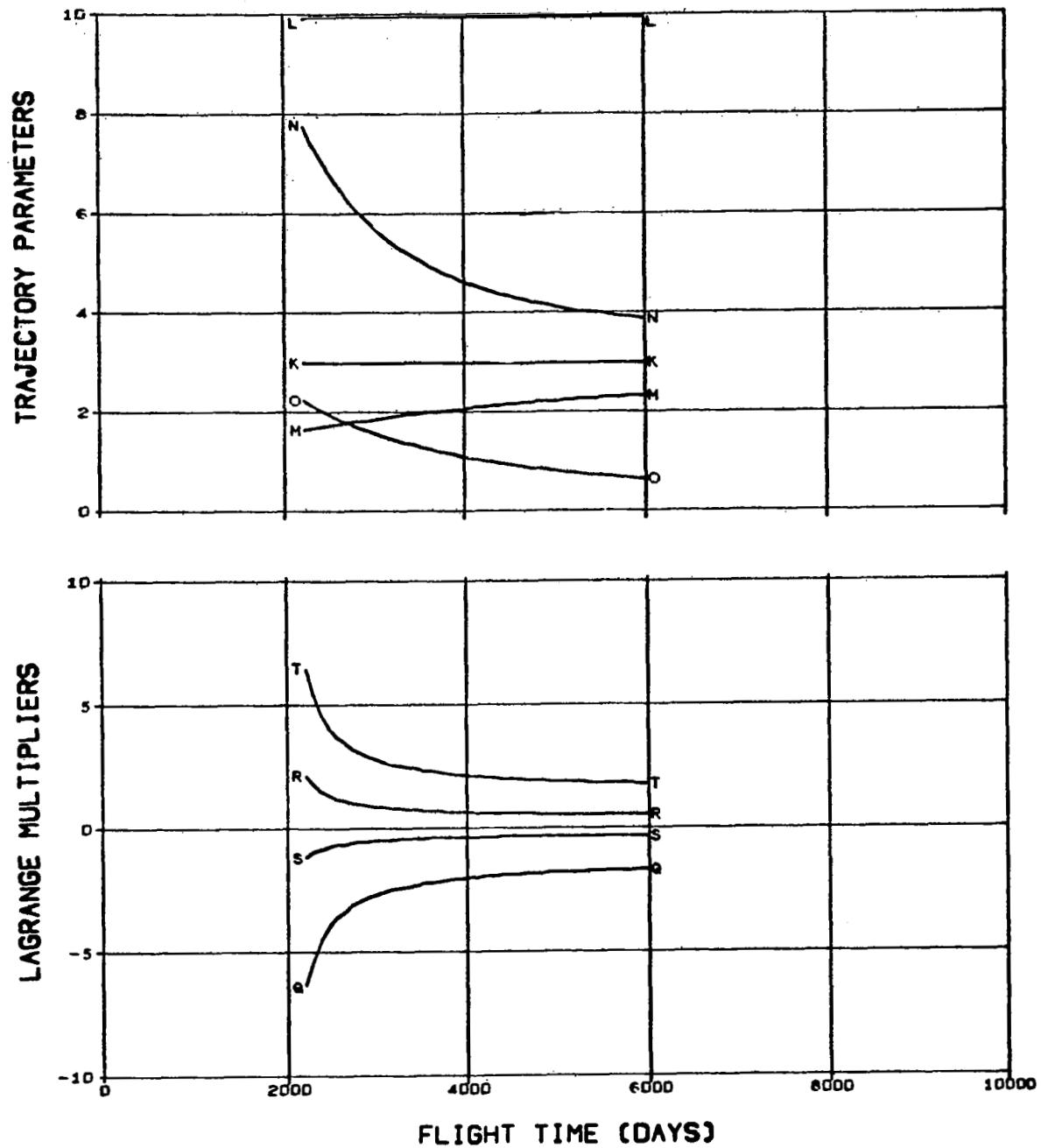


FIG. 8.1.5 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/100

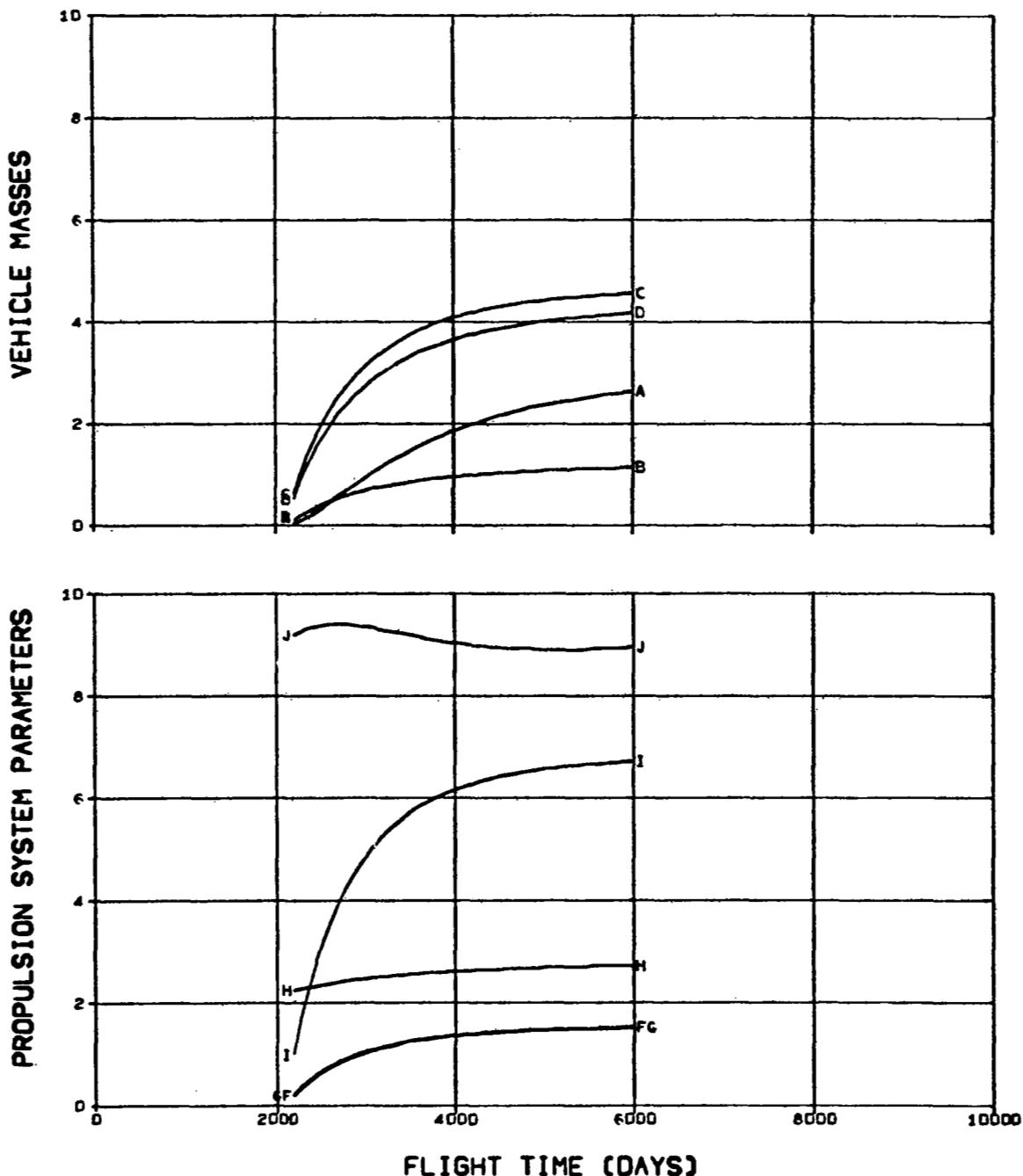


FIG. 8.1.6 NEPTUNE MODE A FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/10	Q	X-COMPONENT OF PRIMER
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER/10
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

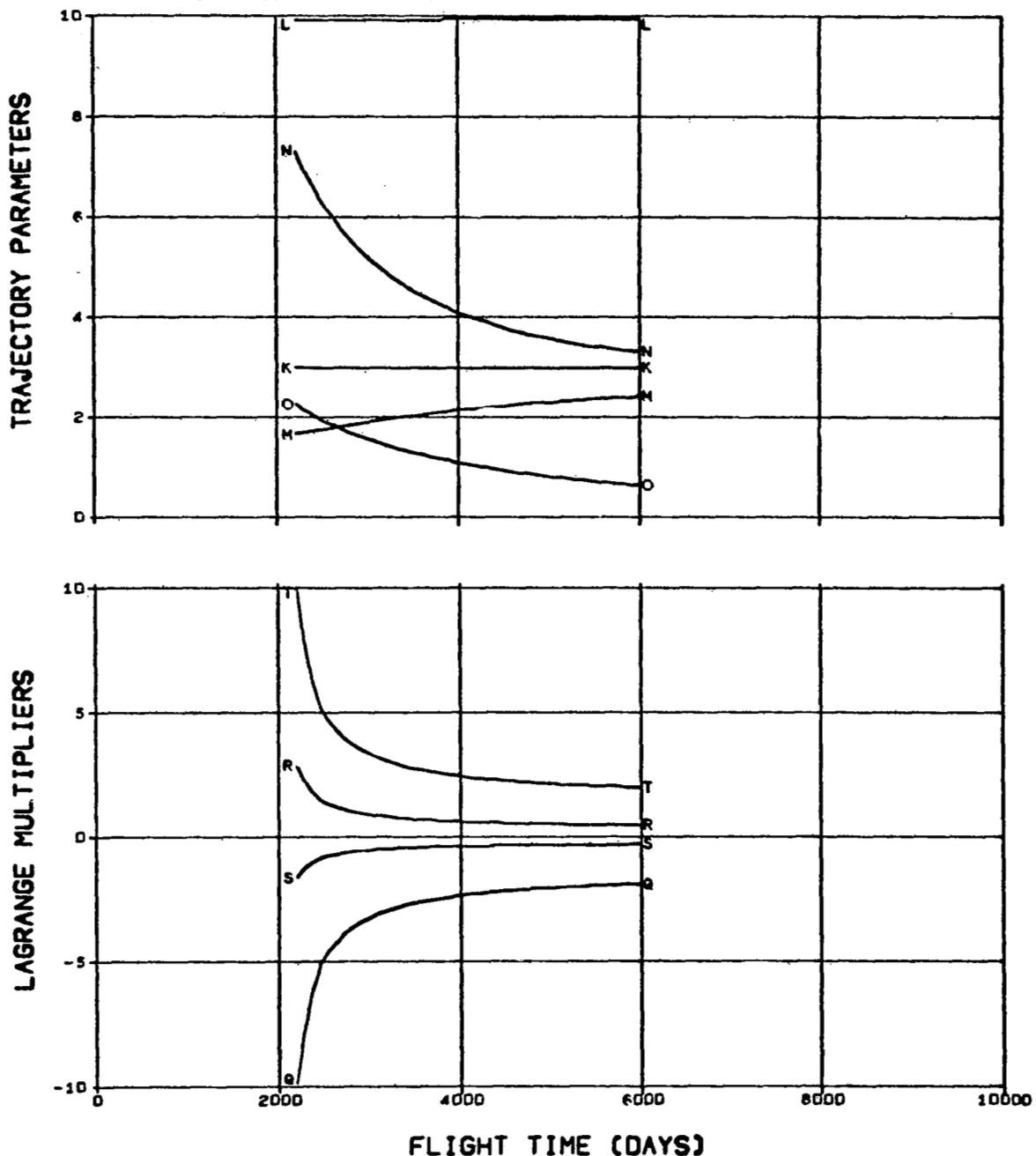
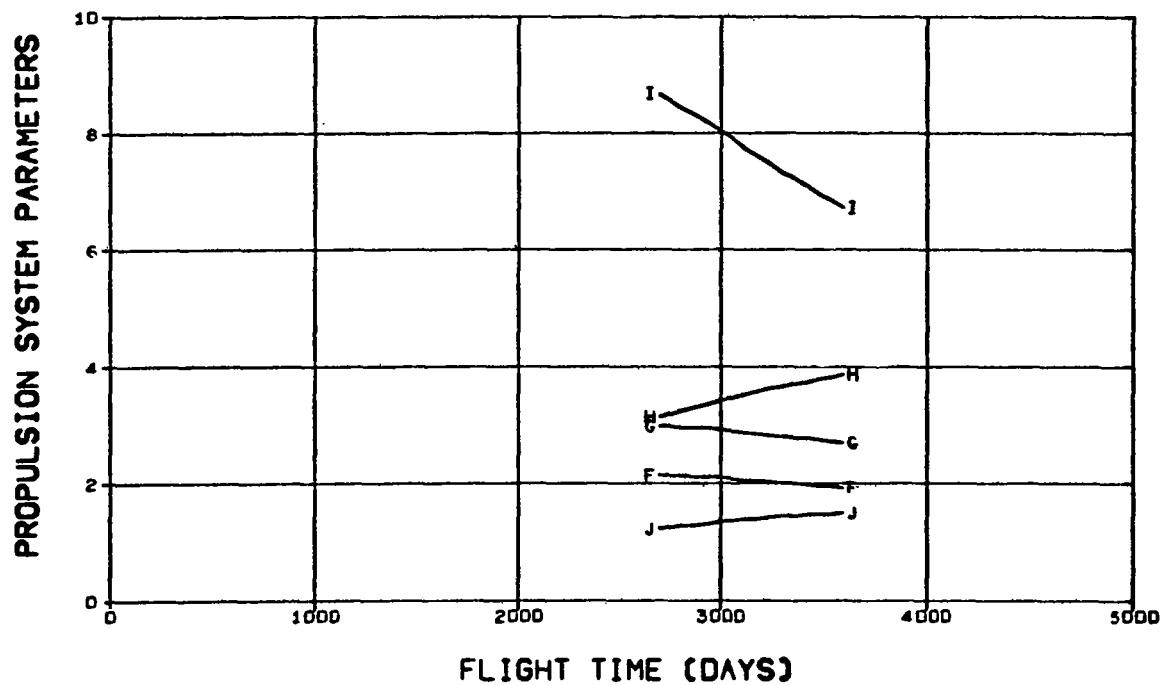
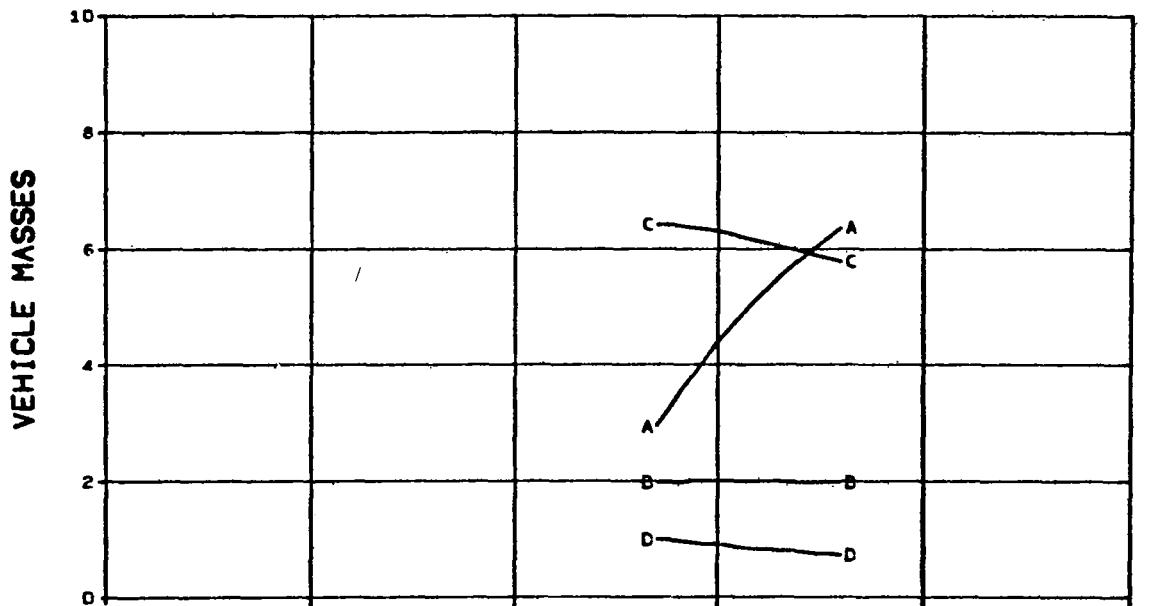


FIG. 8.1.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/1000



**FIG. 8.2.1 NEPTUNE MODE B FLYBY MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE**

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

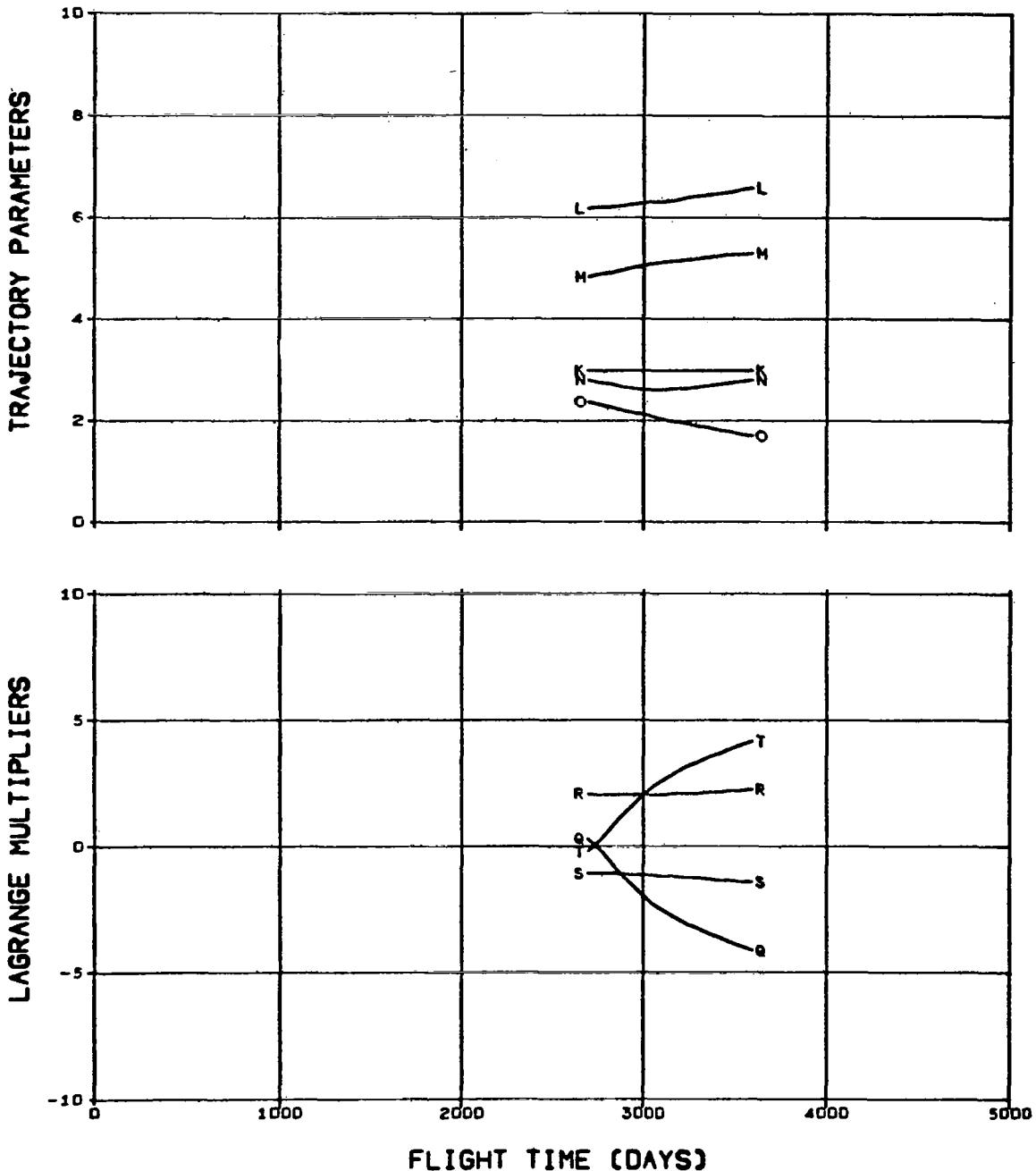


FIG. 8.2.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/1000

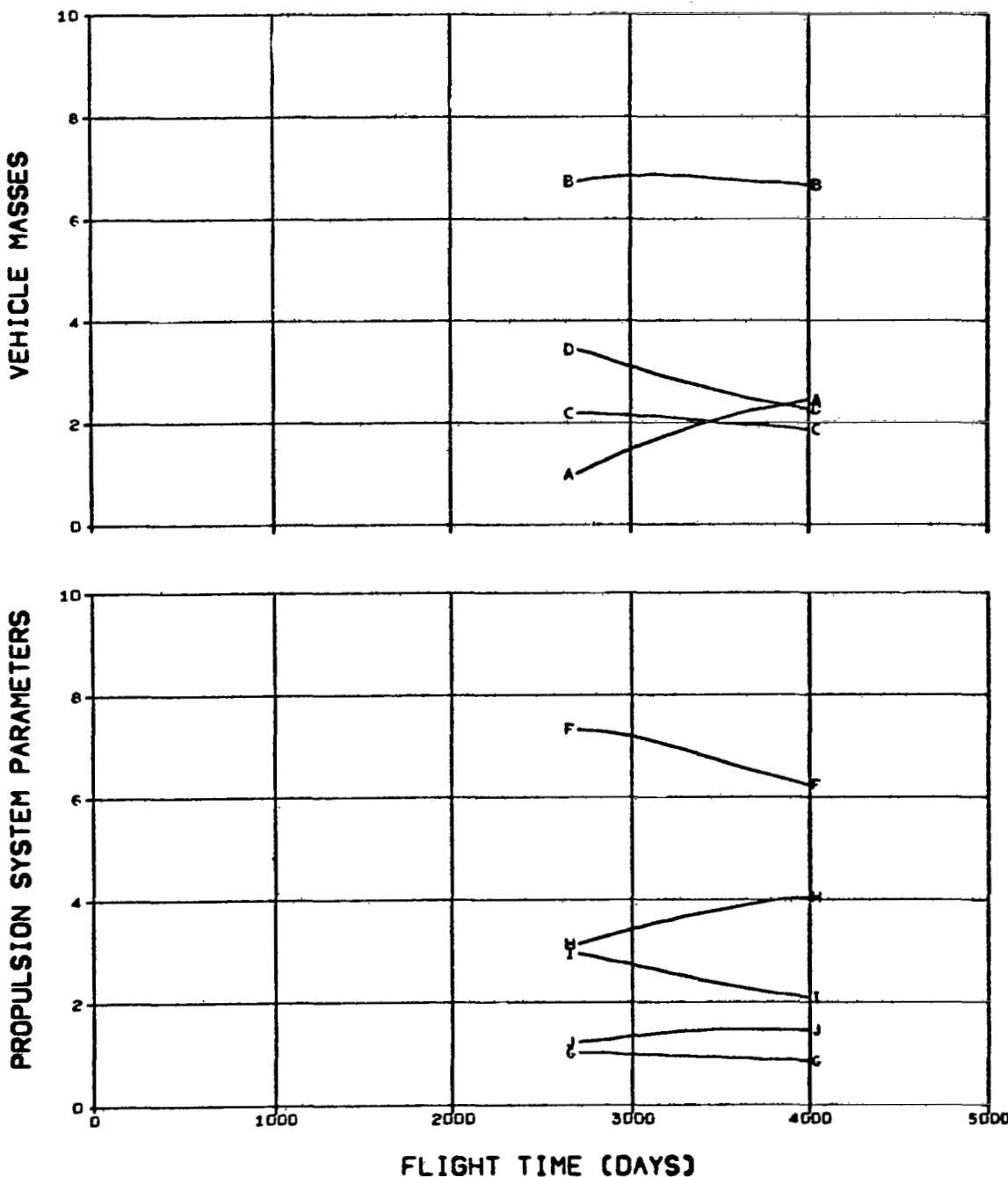


FIG. 8.2.2 NEPTUNE MODE B FLYBY MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE

K	MAXIMUM SOLAR DISTANCE (AU)/10	G	X-COMPONENT OF PRIMER/1.0DE-1
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	Y-COMPONENT OF PRIMER
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	S	X-COMPONENT OF PRIMER DERIVATIVE
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		

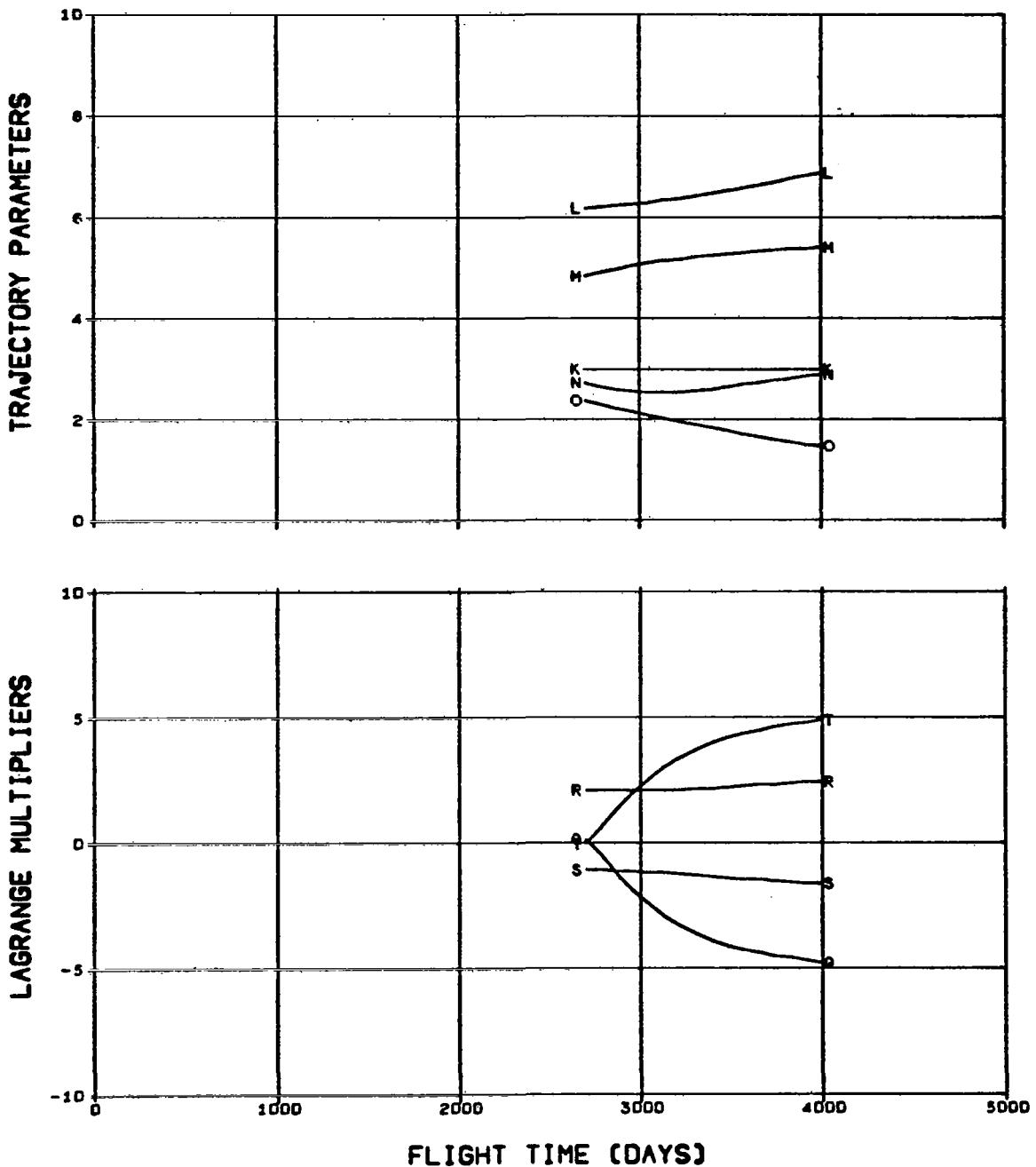


FIG. 8.2.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
		J	PROPELLUTION TIME (DAYS)/1000

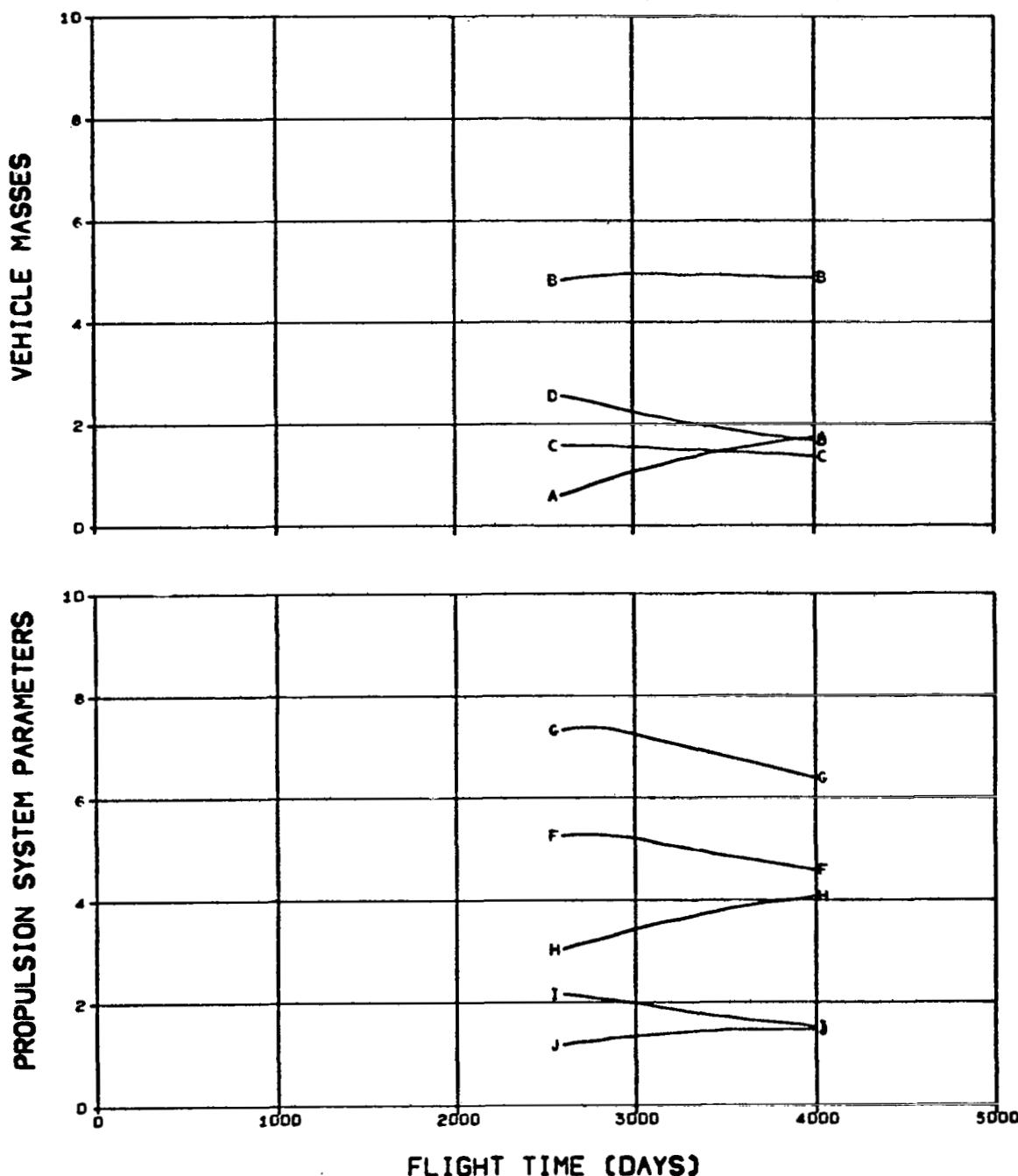


FIG. 8.2.3 NEPTUNE MODE B FLYBY MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

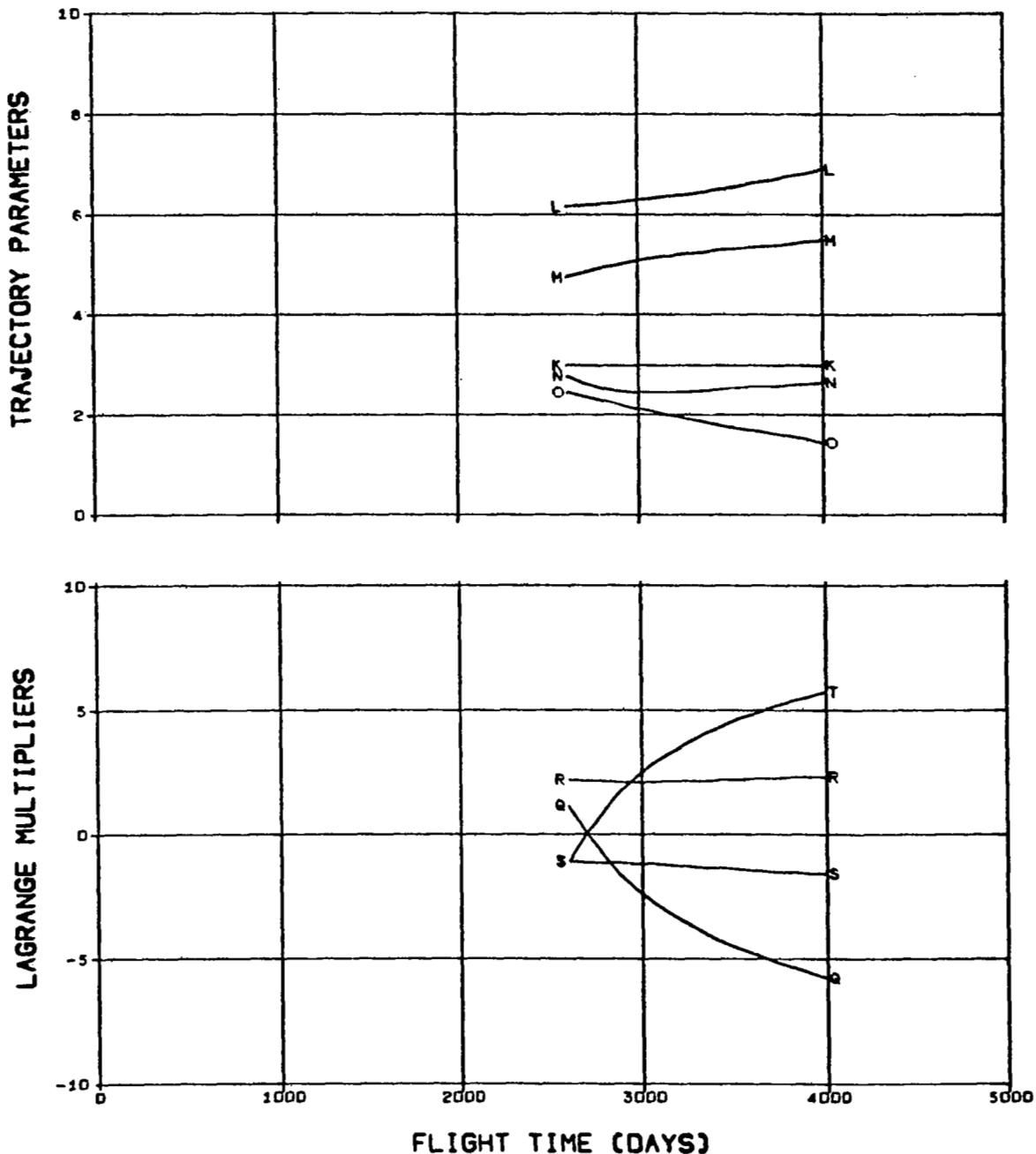


FIG. 8.2.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/1000
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/1000

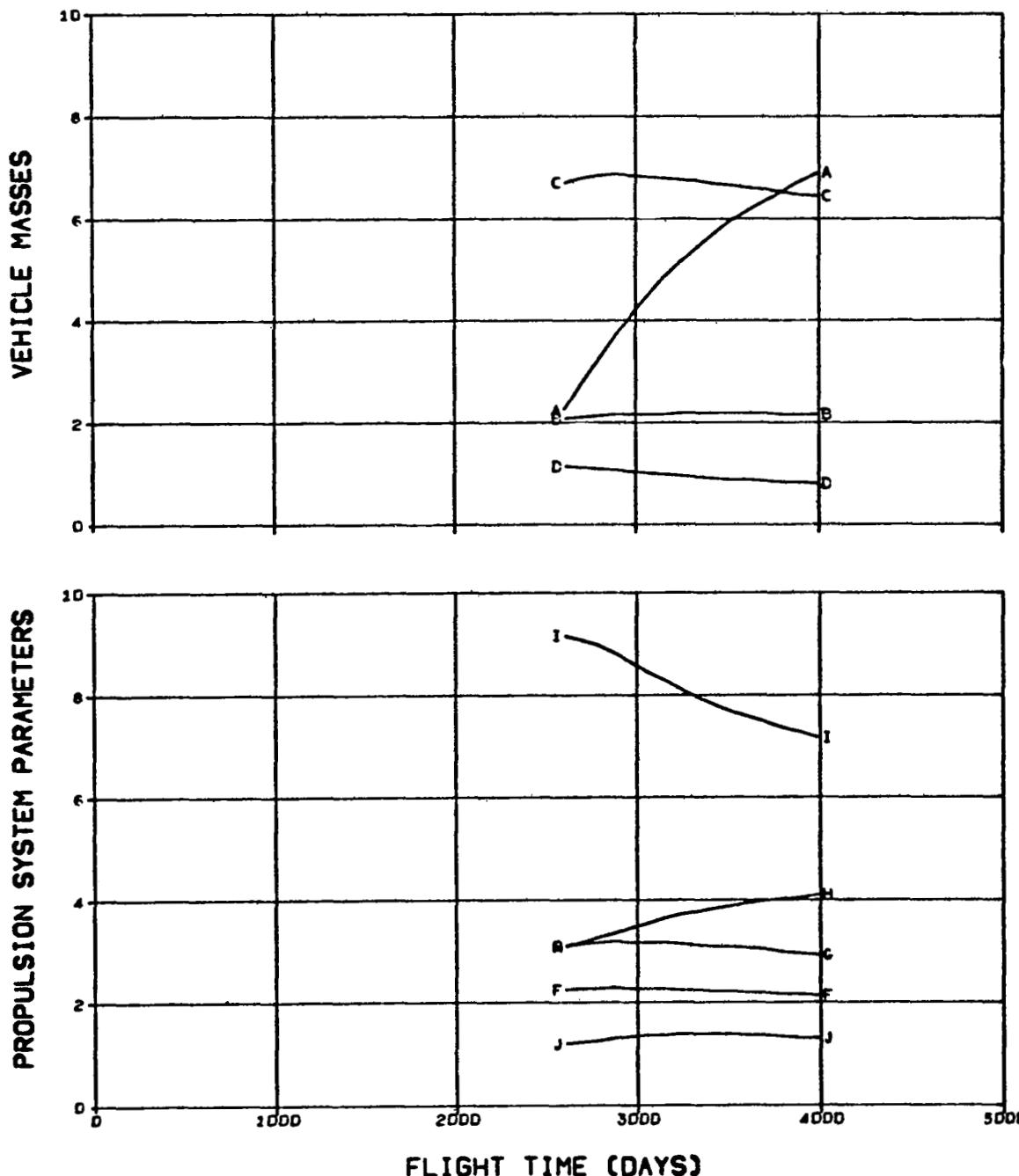


FIG. 8.2.4 NEPTUNE MODE B FLYBY MISSIONS
TITAN III C LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

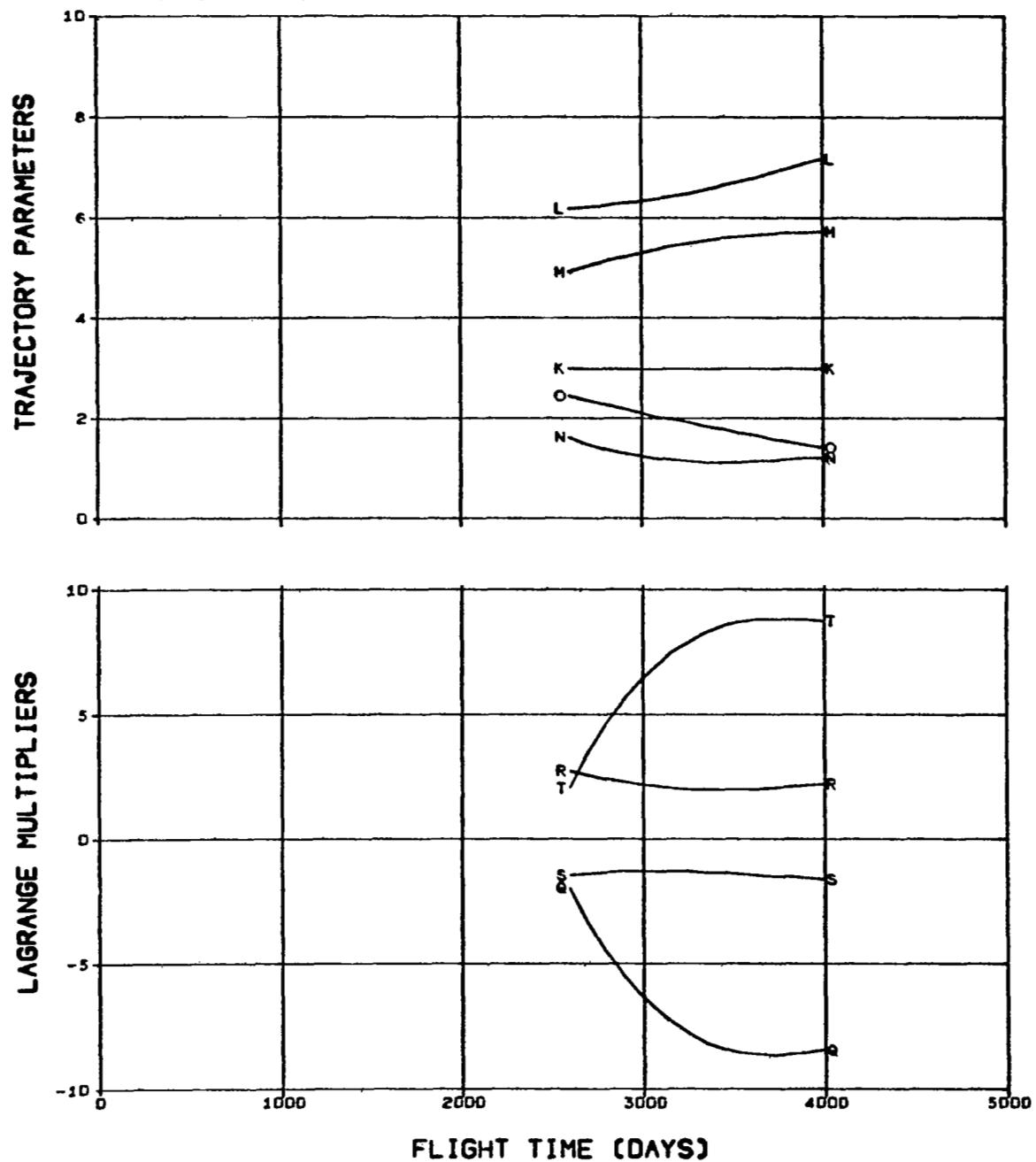


FIG. 8.2.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPULSION TIME (DAYS)/1000

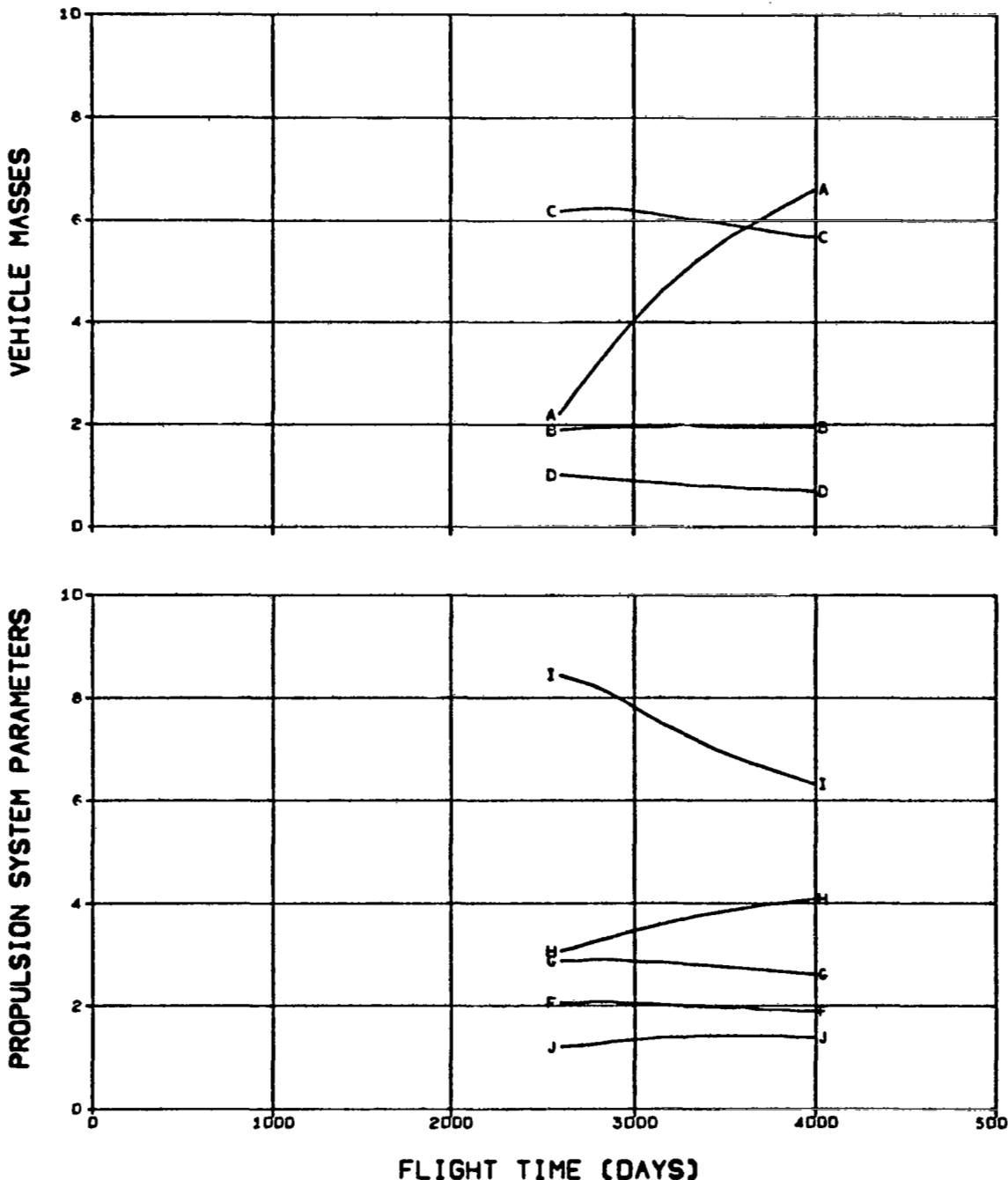


FIG. 8.2.5 NEPTUNE MODE B FLYBY MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.0DE-1
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

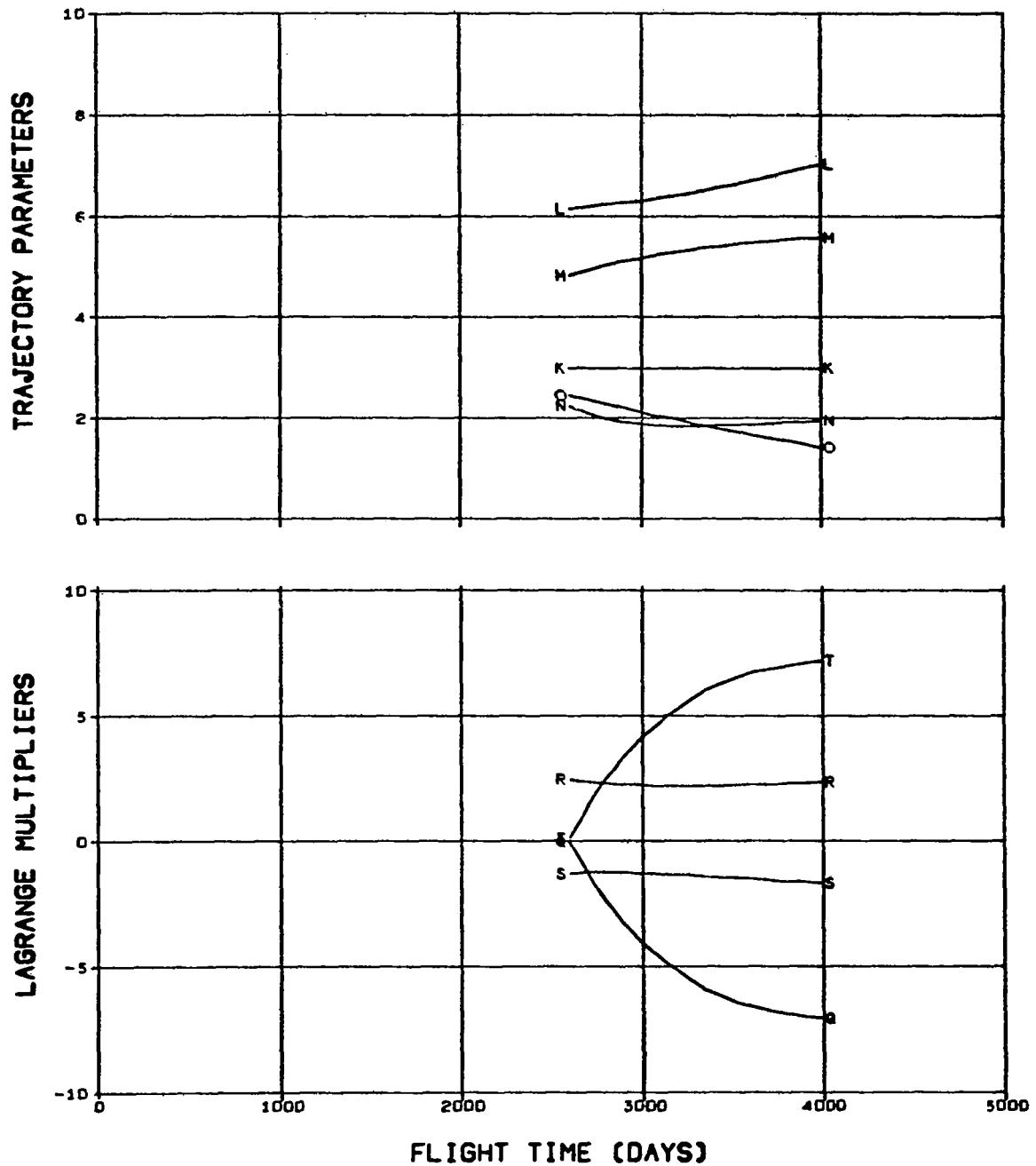


FIG. 8.2.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
		J	PROPELLUTION TIME (DAYS)/1000

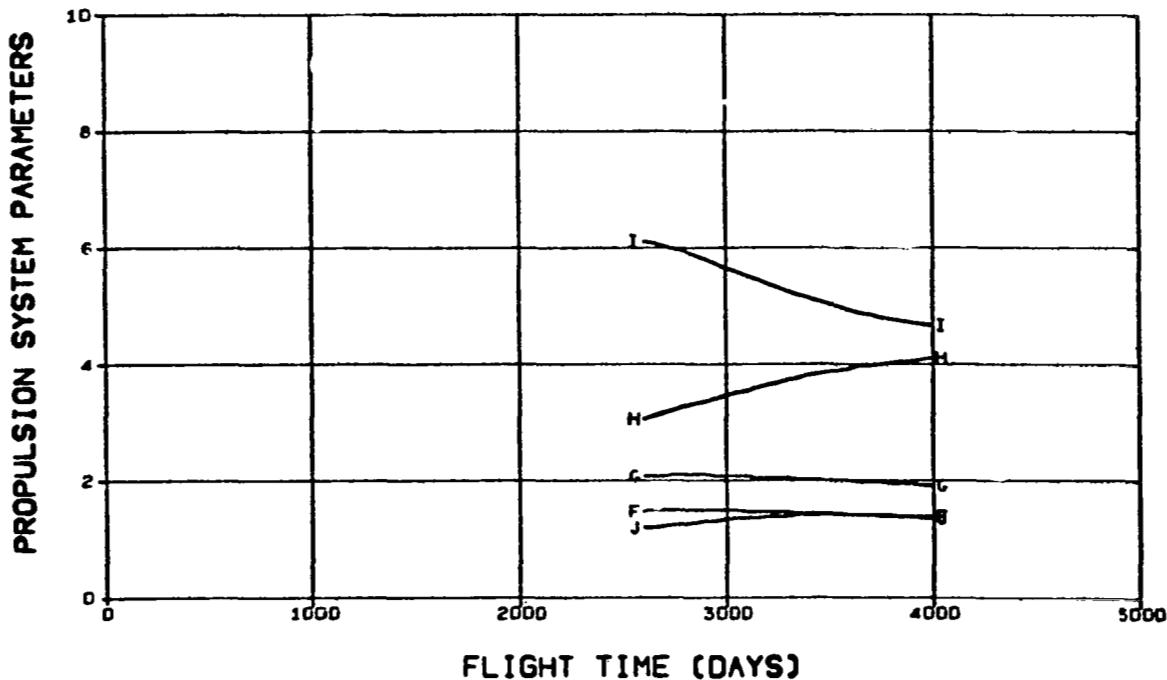
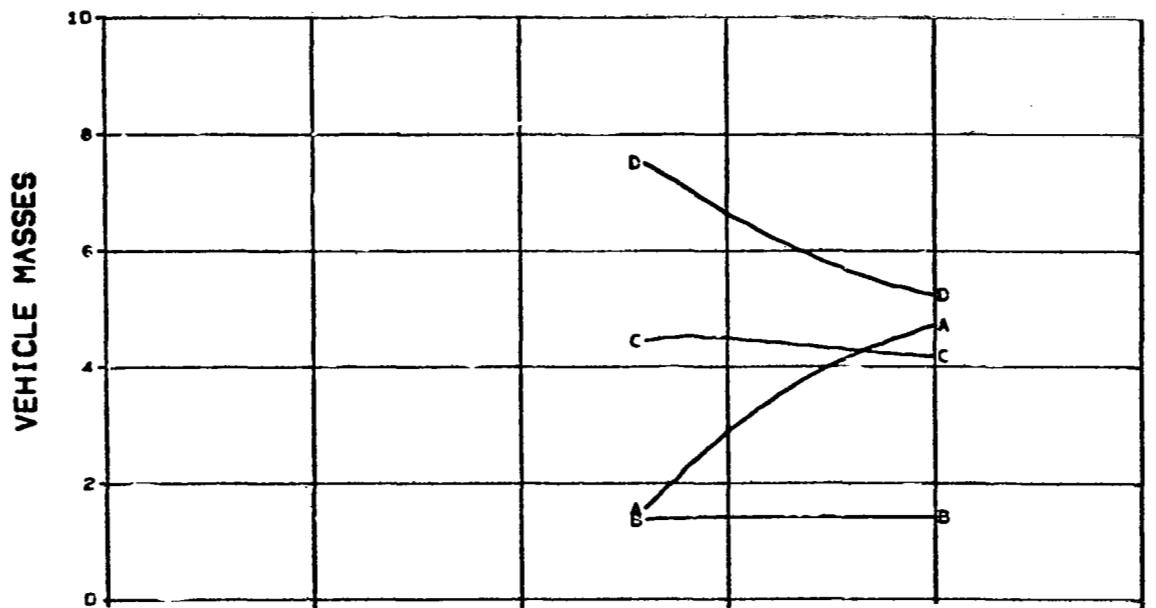


FIG. 8.2.6 NEPTUNE MODE B FLYBY MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE

K MAXIMUM SOLAR DISTANCE (AU)/10 Q X-COMPONENT OF PRIMER/1.0DE-2
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 R Y-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 S X-COMPONENT OF PRIMER DERIVATIVE
 N LAUNCH EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1
 O ARRIVAL EXCESS SPEED (M/SEC)/10000

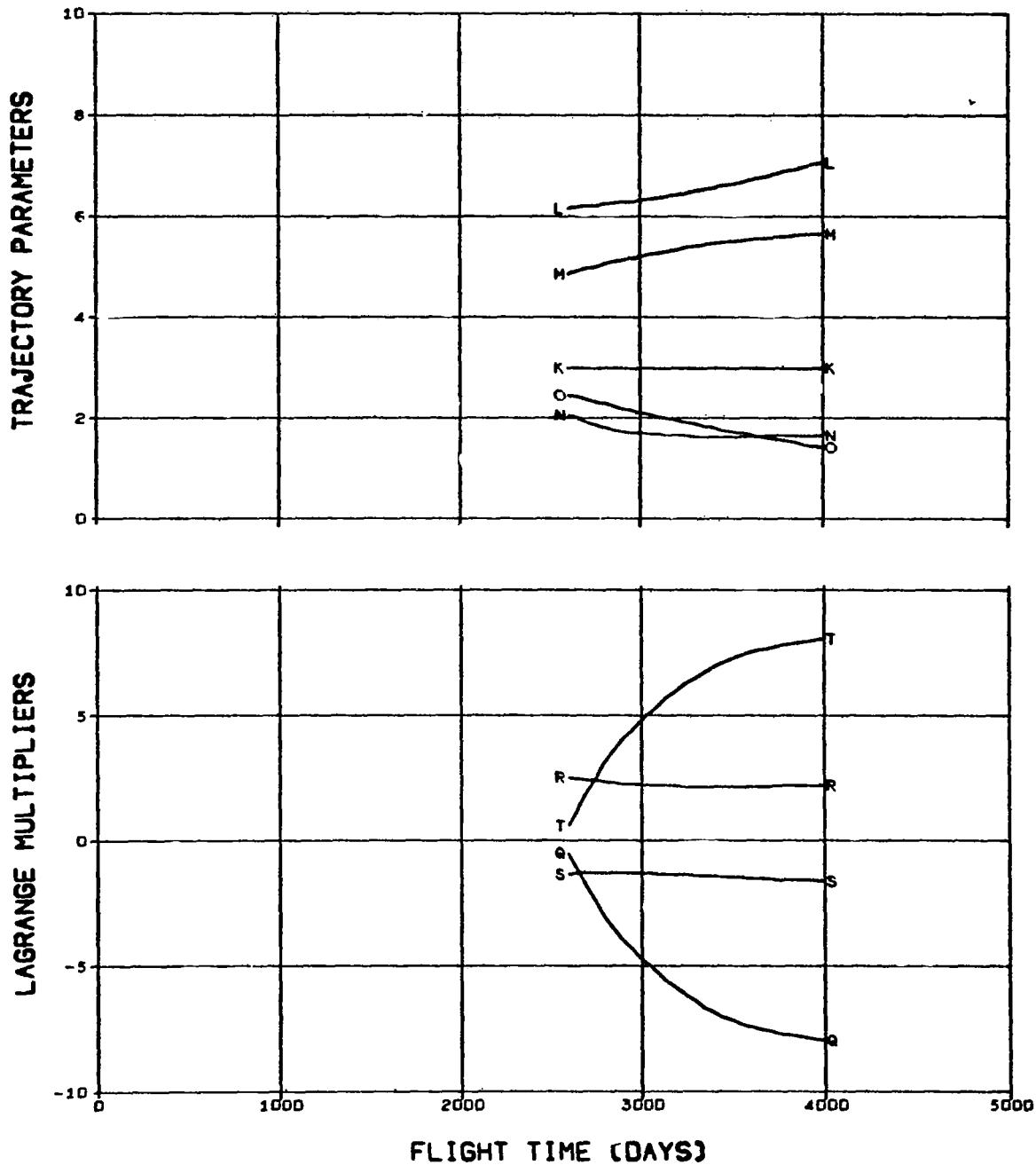
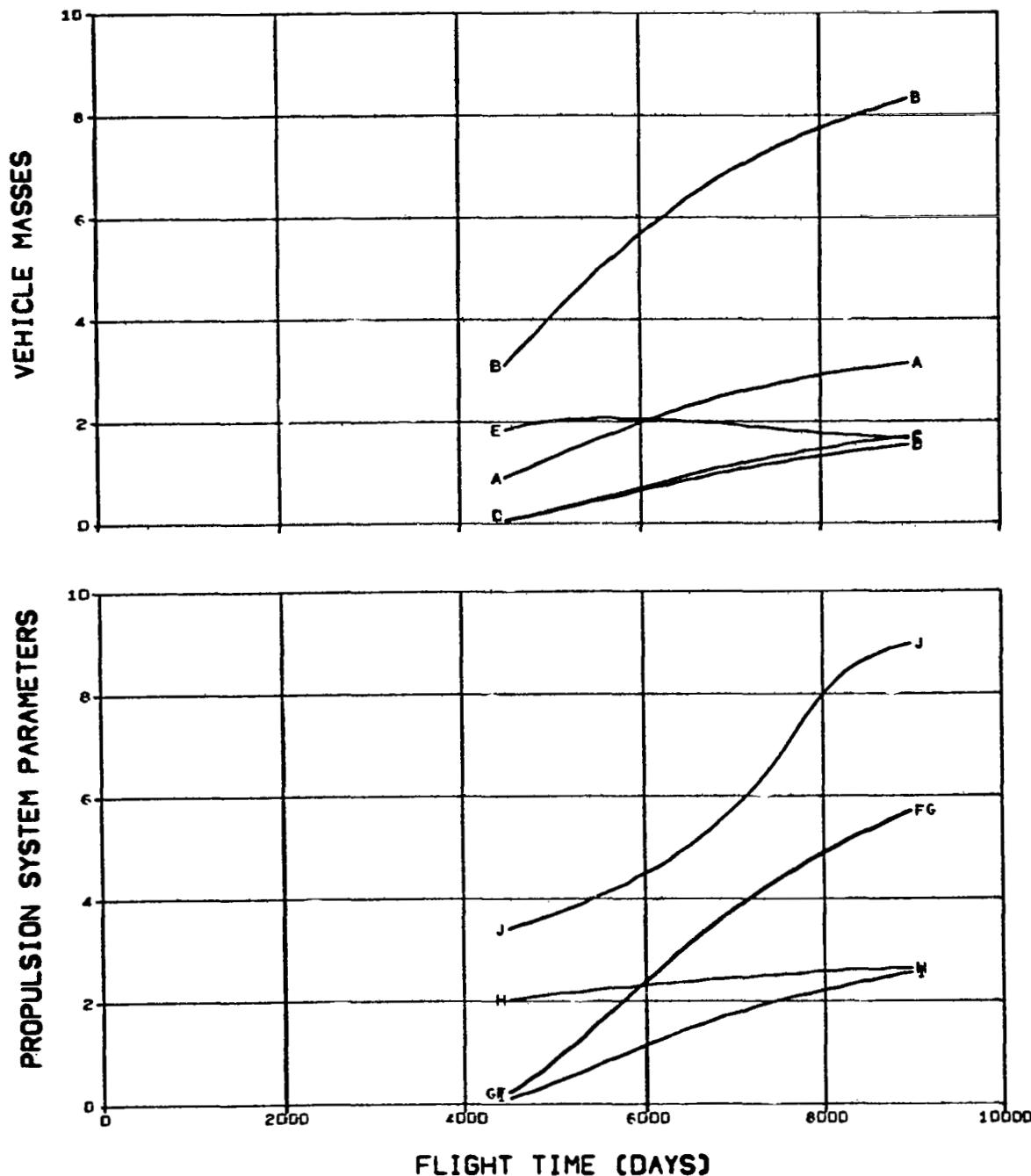


FIG. 8.2.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 8.3.1 NEPTUNE MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/10000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

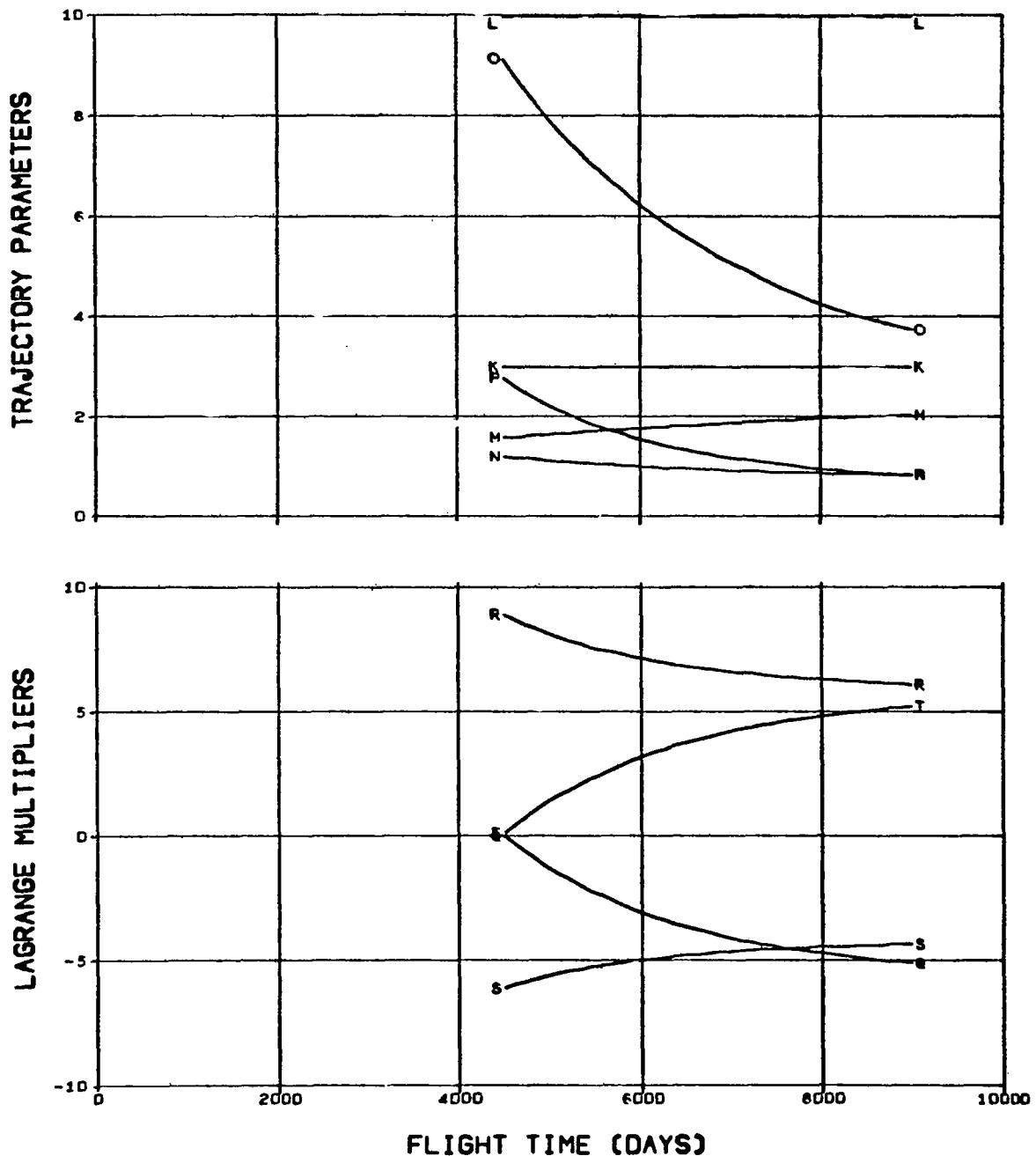
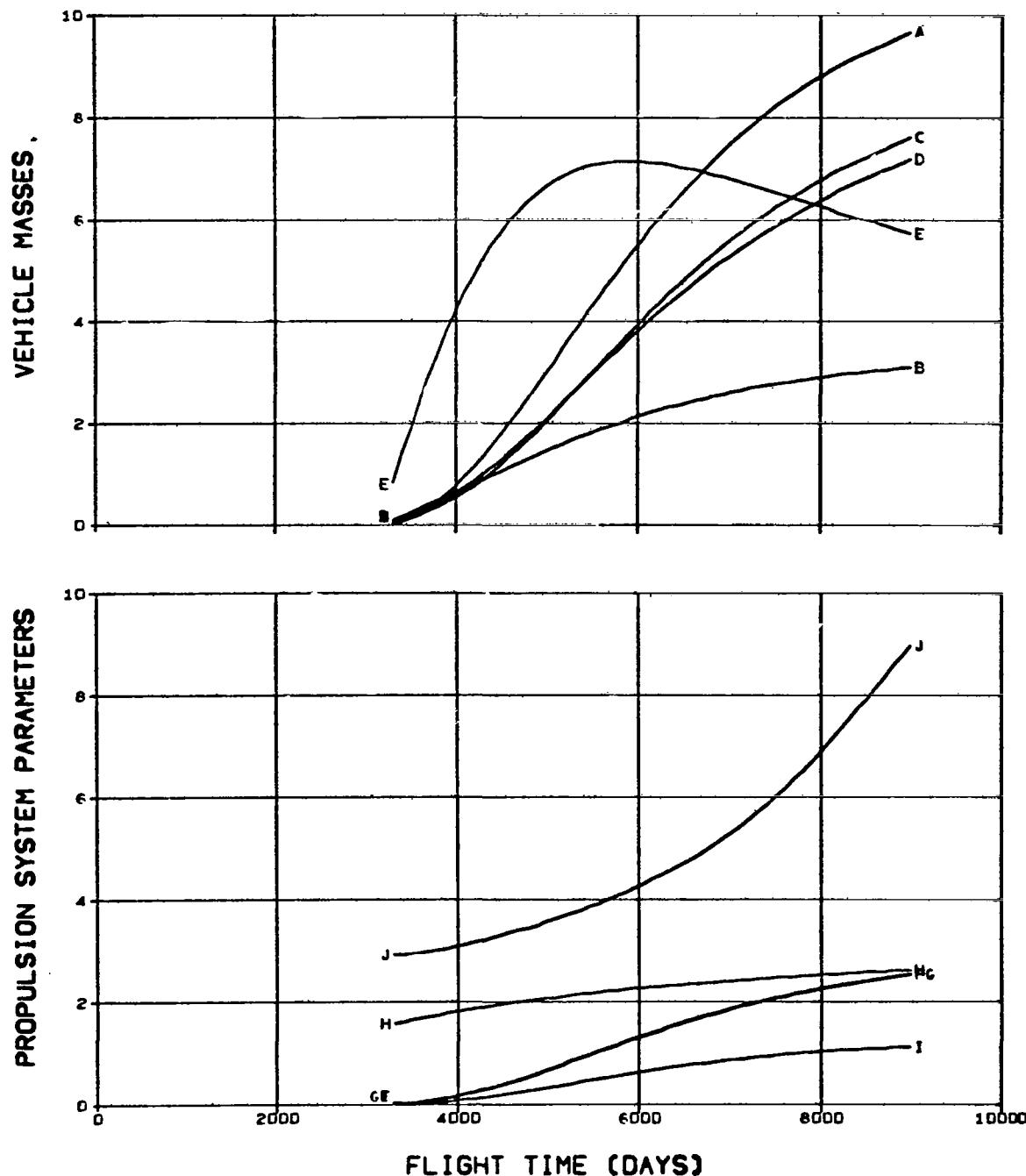


FIG. 8.3.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLSION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 8.3.2 NEPTUNE MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPELLSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/10000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

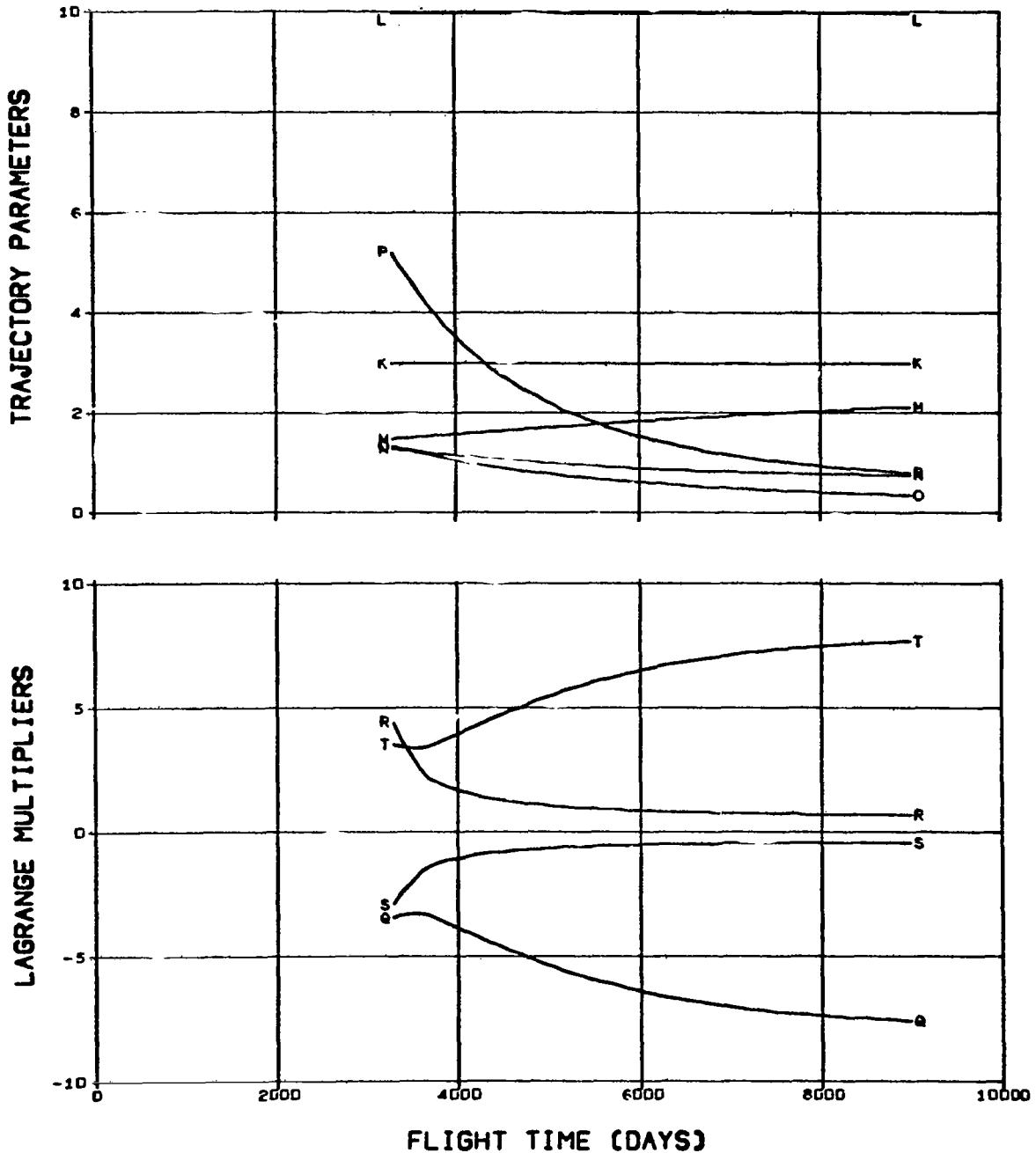
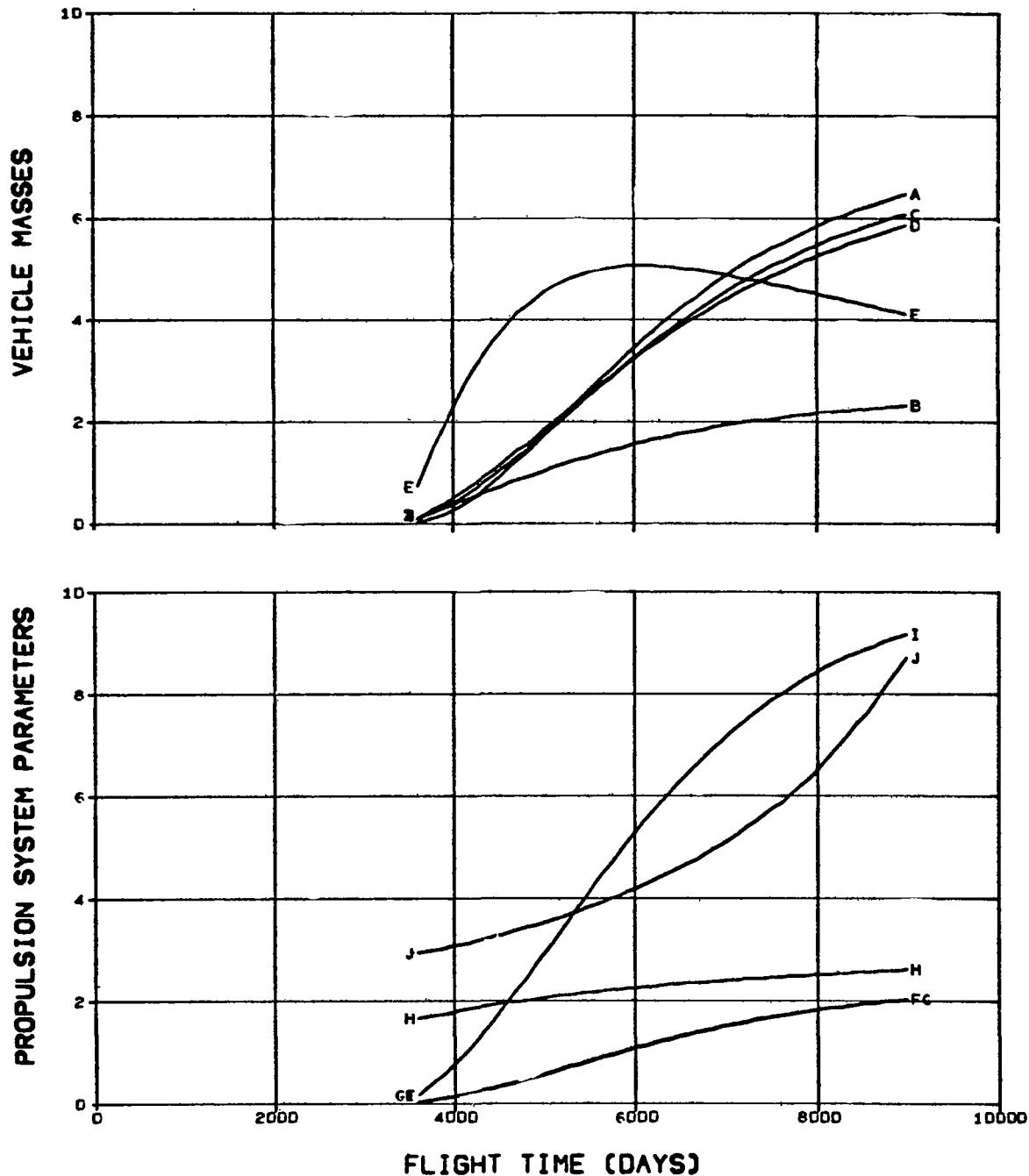


FIG. 8.3.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 8.3.3 NEPTUNE MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/10000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/10000	T	Y-COMPONENT OF PRIMER DERIVATIVE

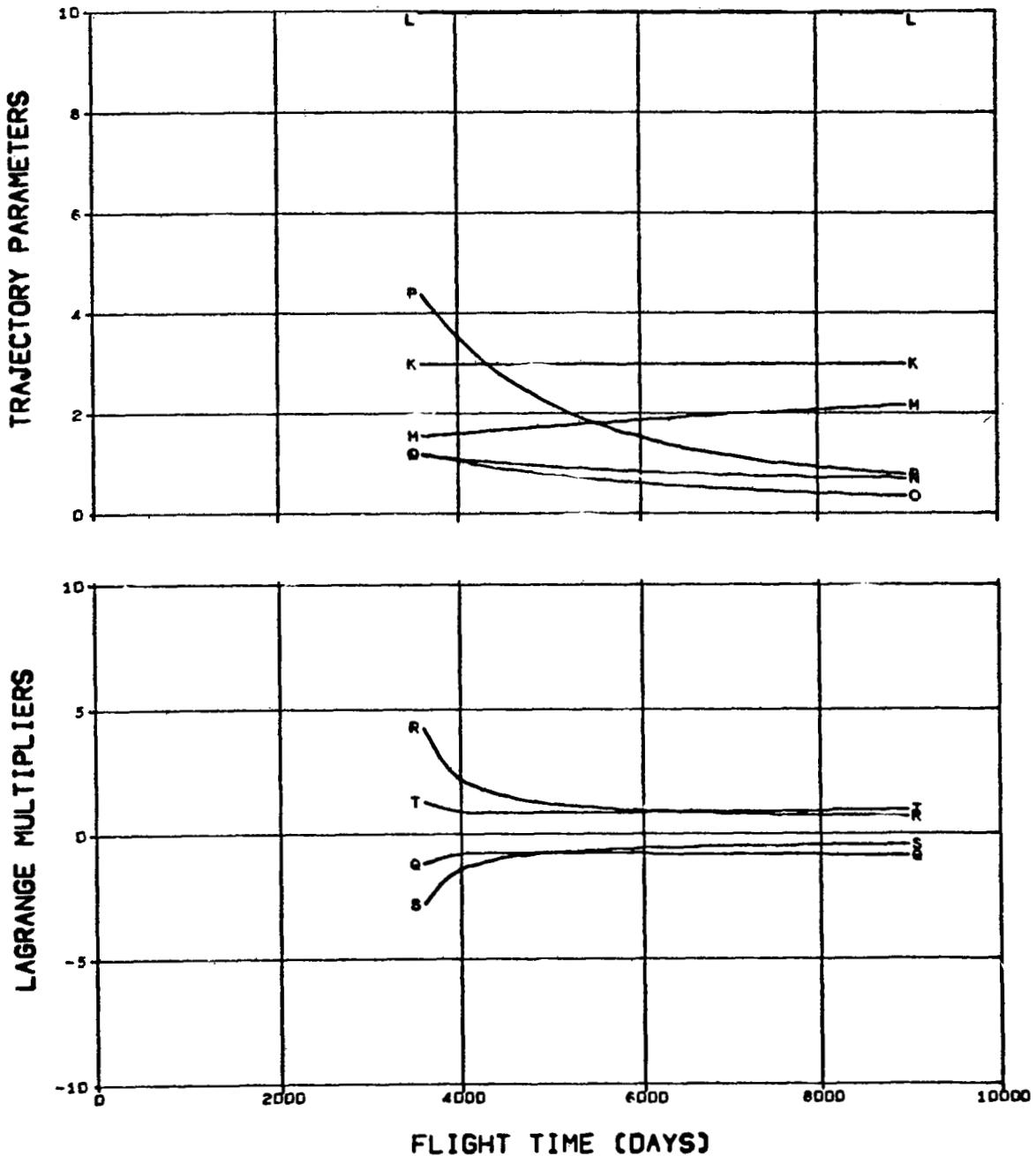


FIG. 8.3.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLION TIME (DAYS)/1000

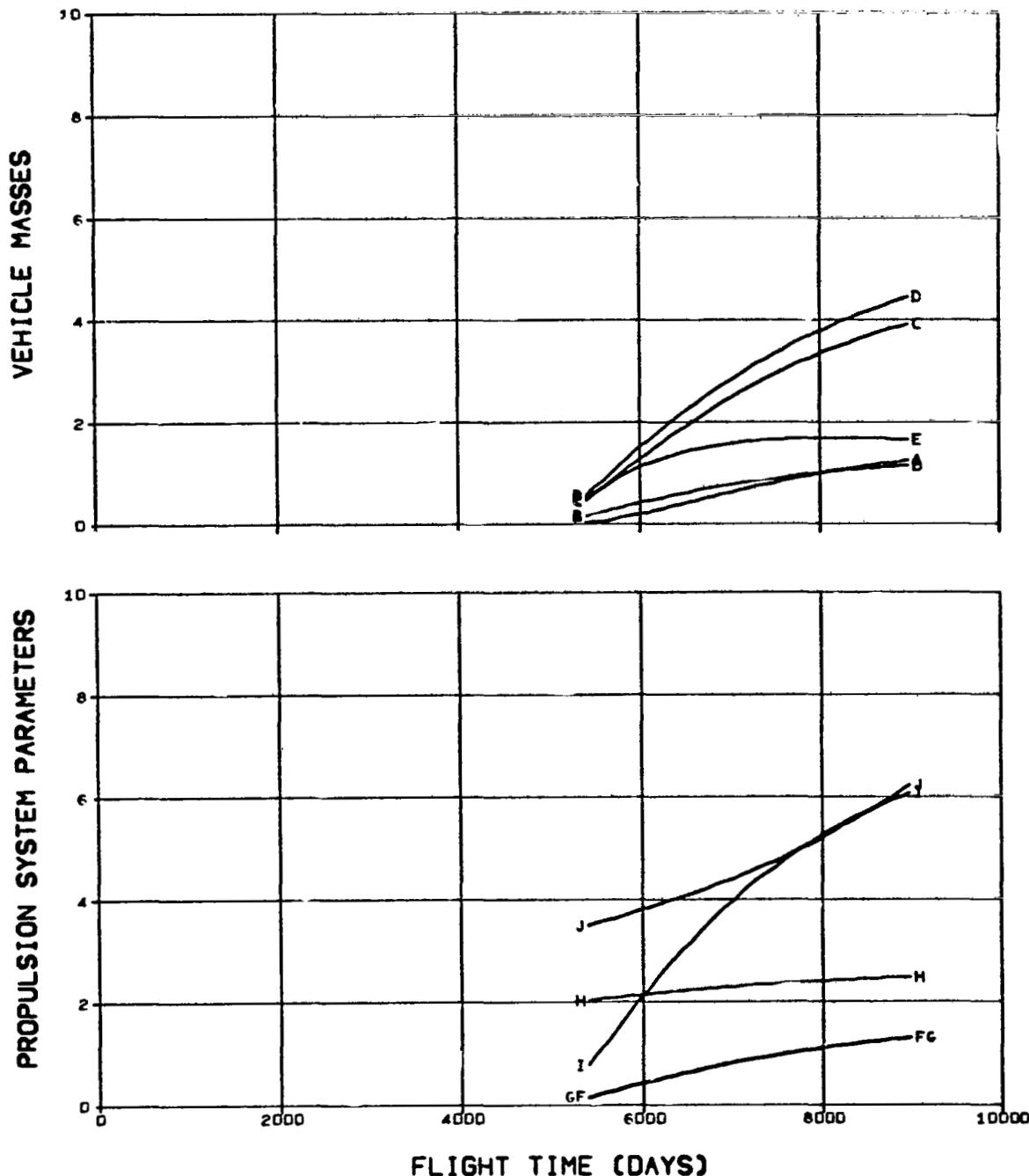


FIG. 8.3.4 NEPTUNE MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

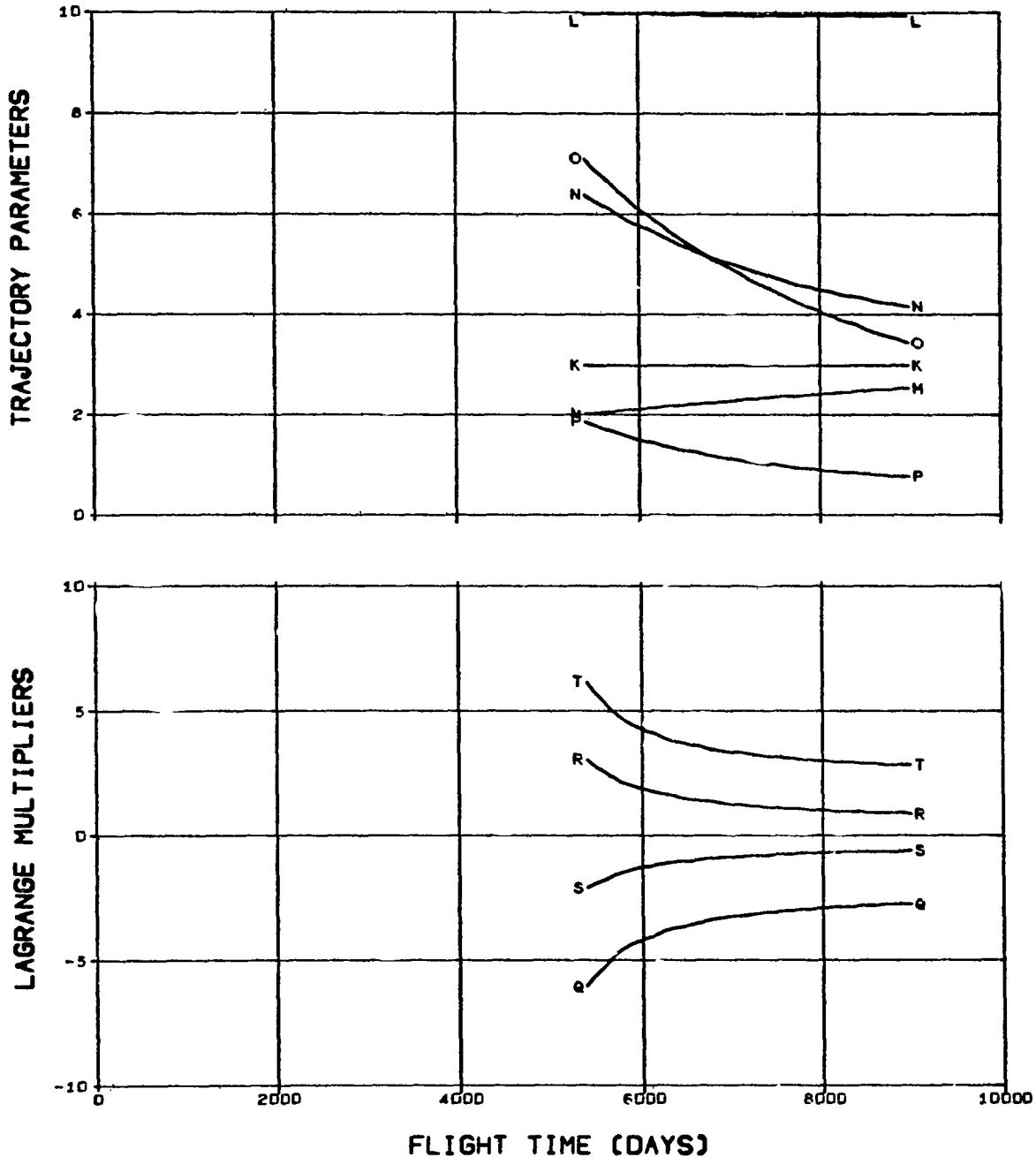


FIG. 8.3.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/100	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-2
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

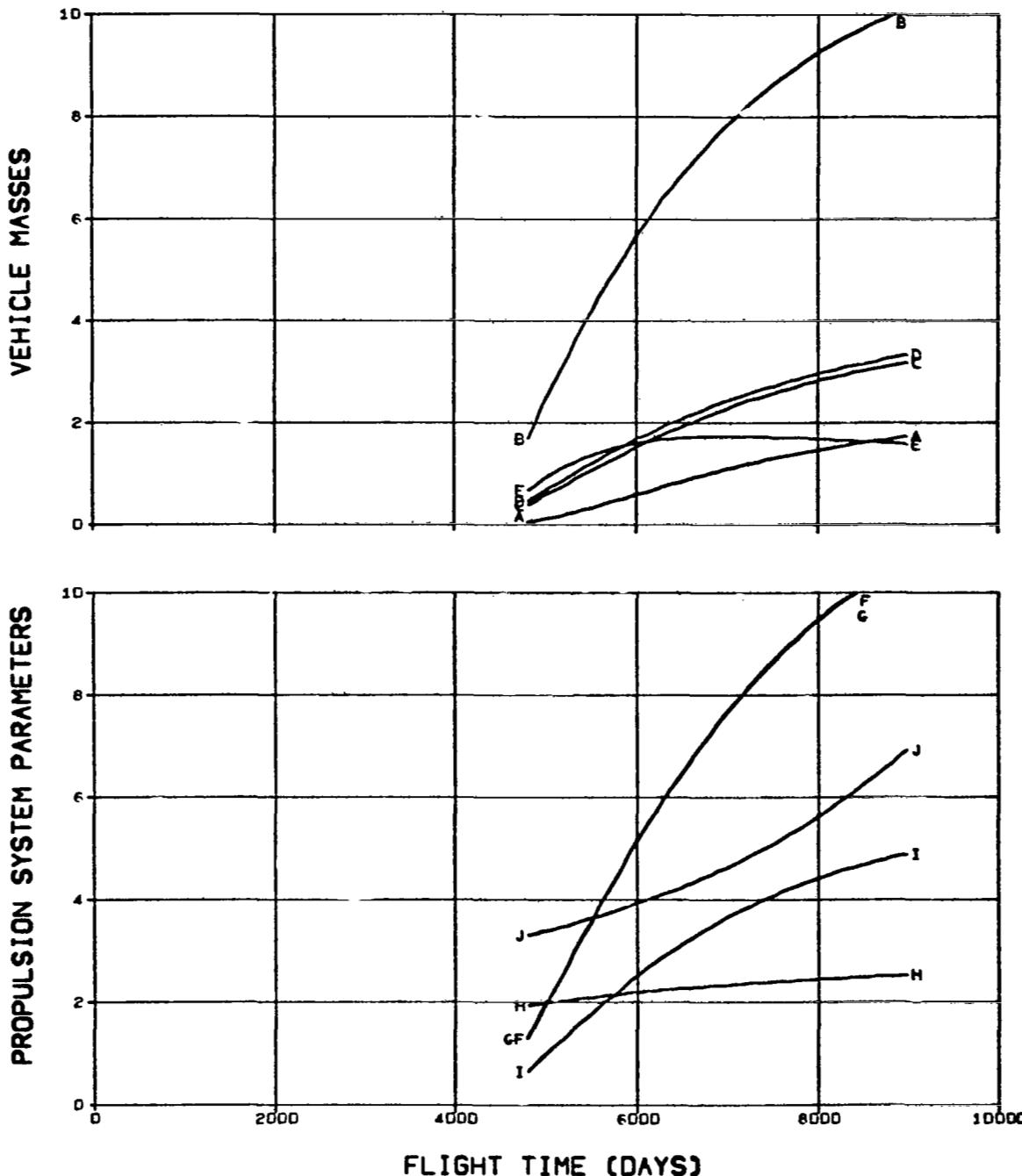


FIG. 8.3.5 NEPTUNE MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPARTIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

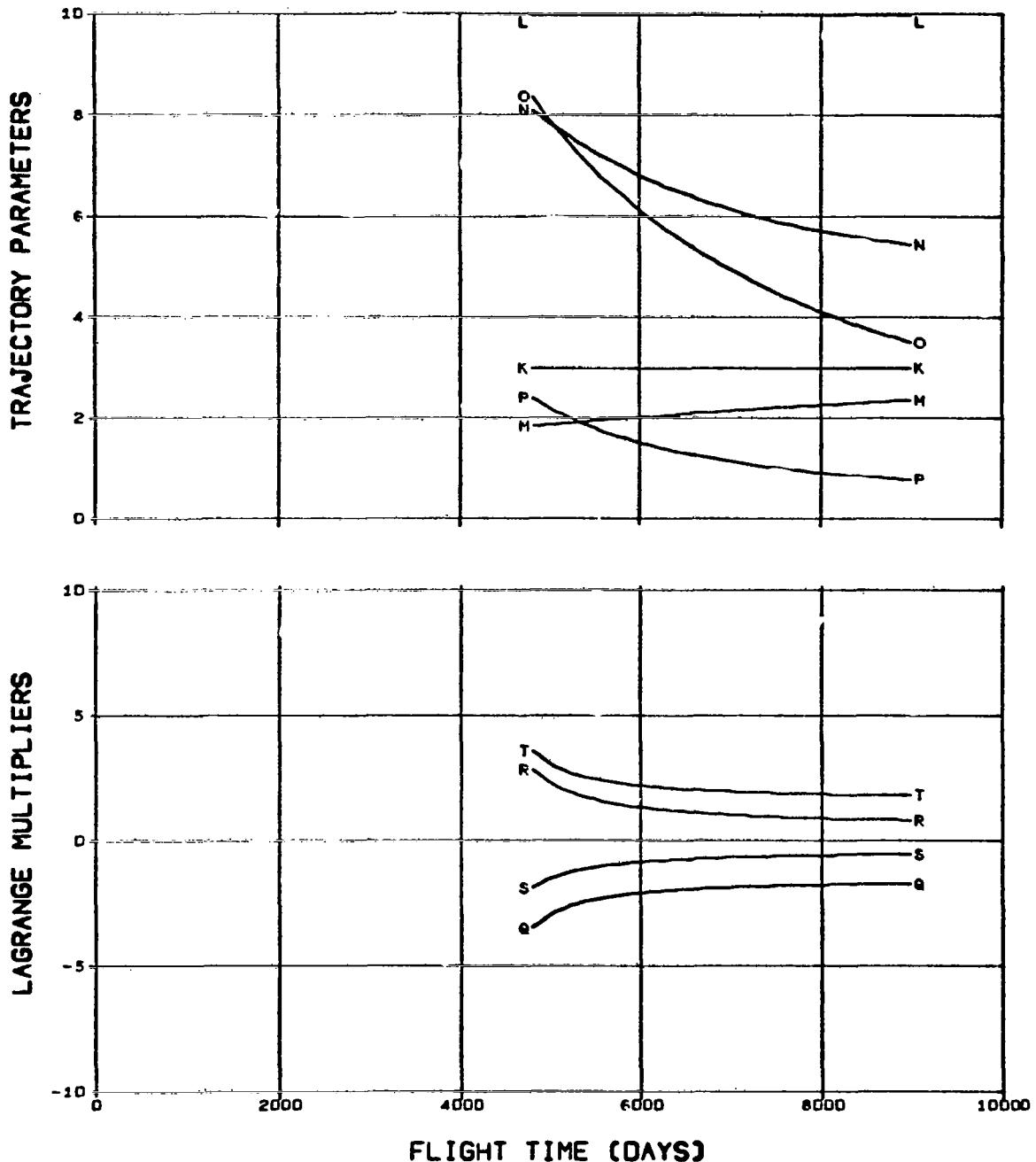


FIG. 8.3.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/10	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/100	G	MAXIMUM POWER (KW)
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

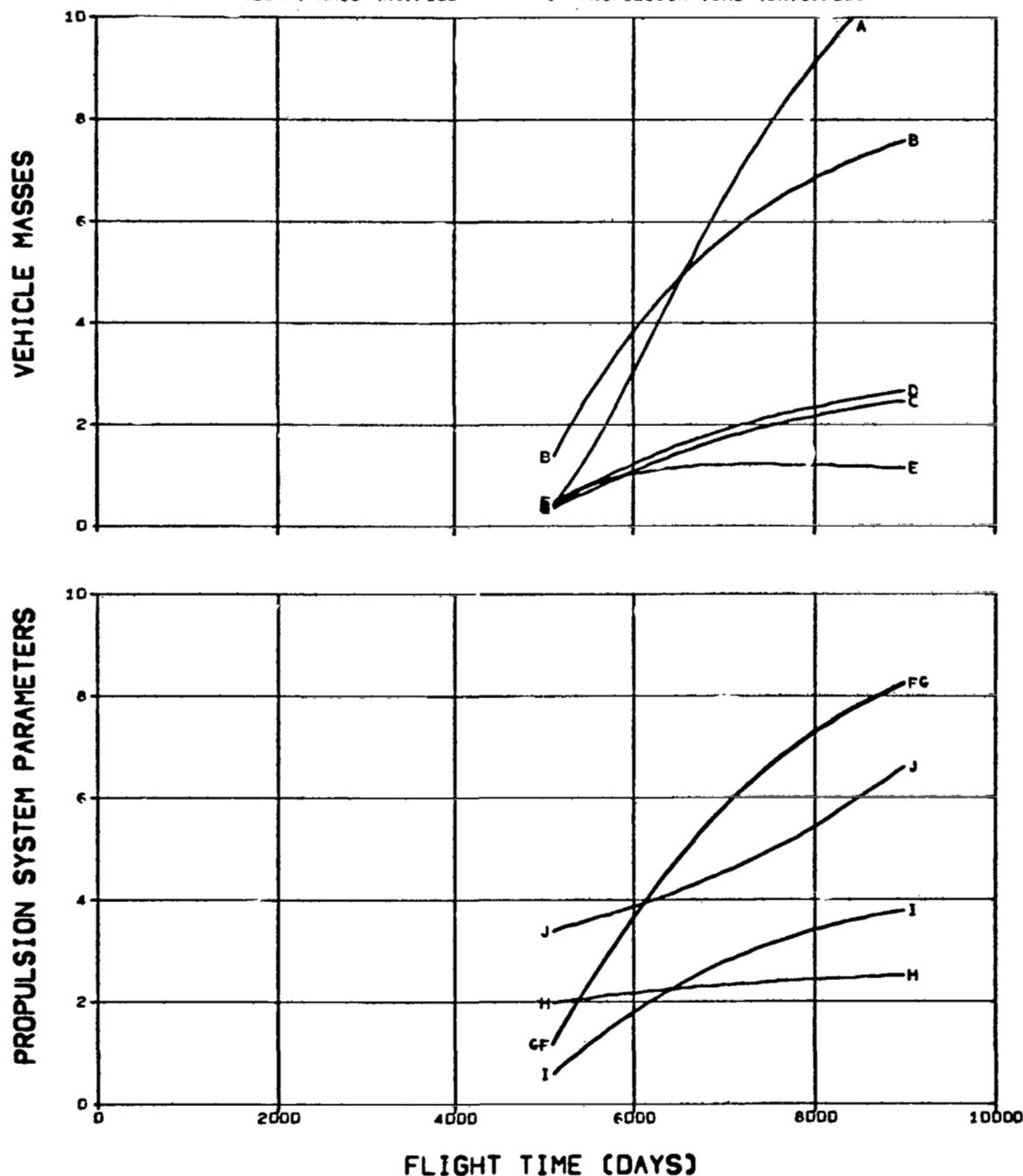


FIG. 8.3.6 NEPTUNE MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER/10
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE/10
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

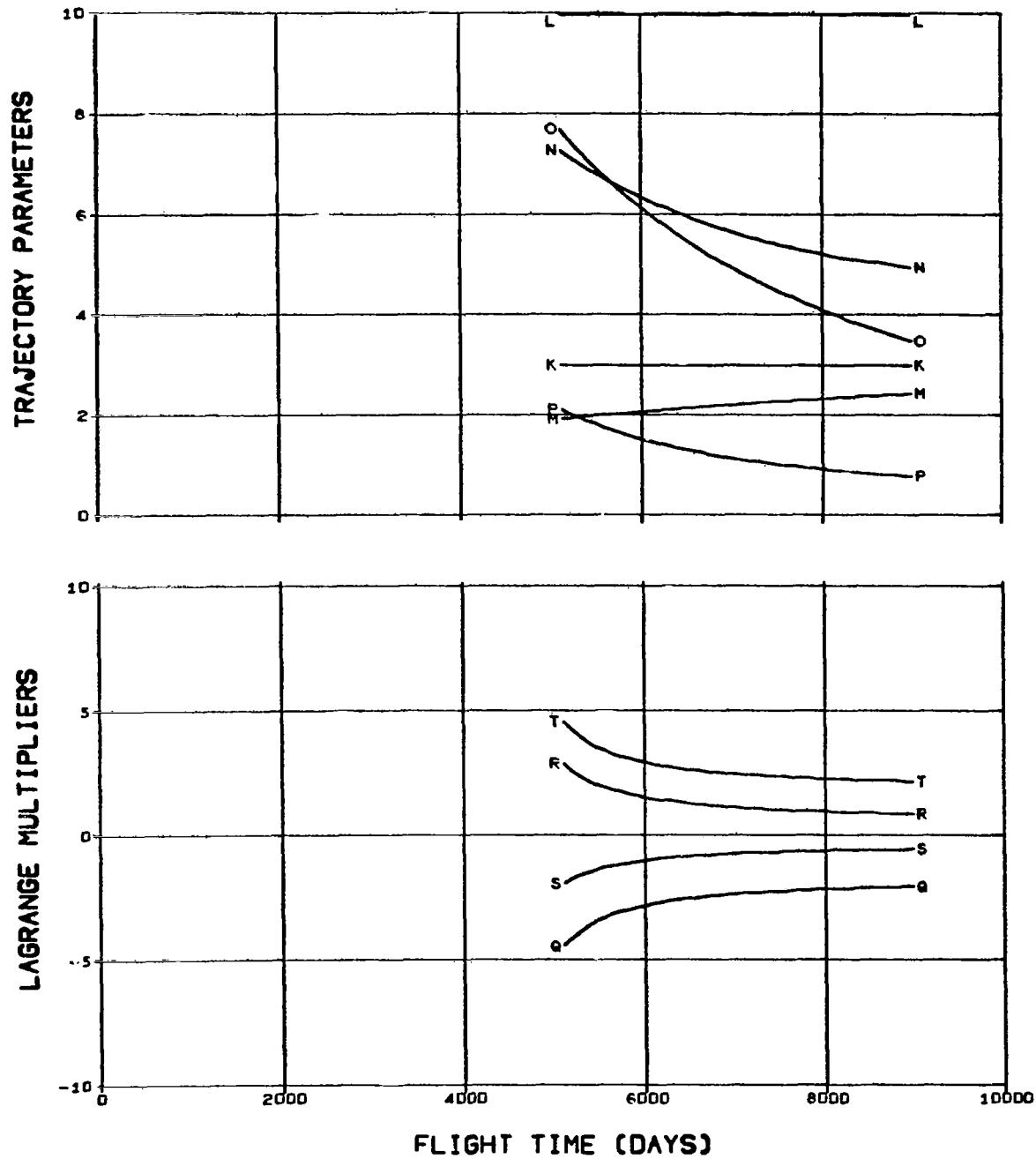


FIG. 8.3.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

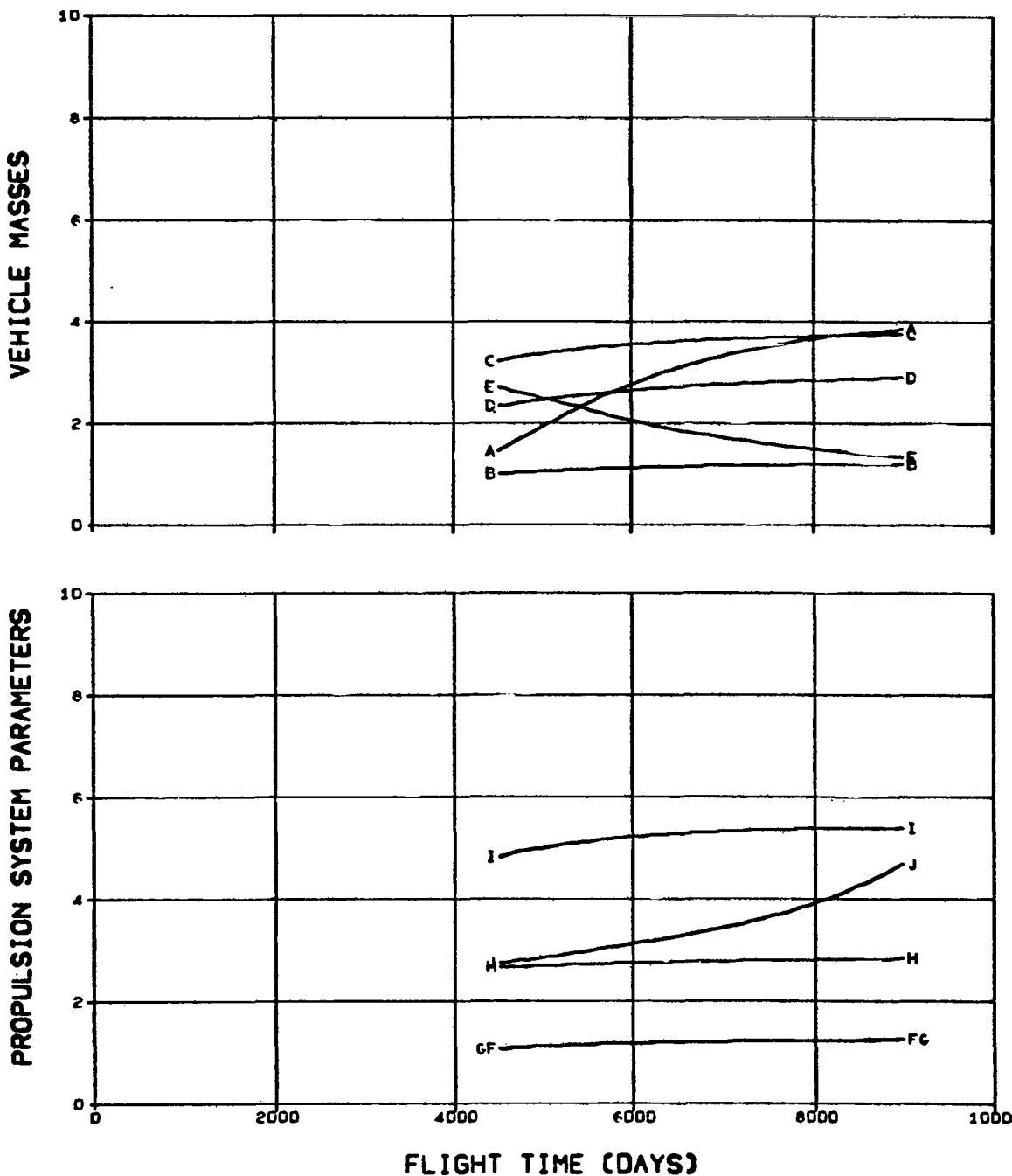


FIG. 8.4.1 NEPTUNE MODE A ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10.	Q	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	R	X-COMPONENT OF PRIMER/1.0DE-1
M	HELIOPERTHETIC TRAVEL ANGLE (DEG)/100	S	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000		Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

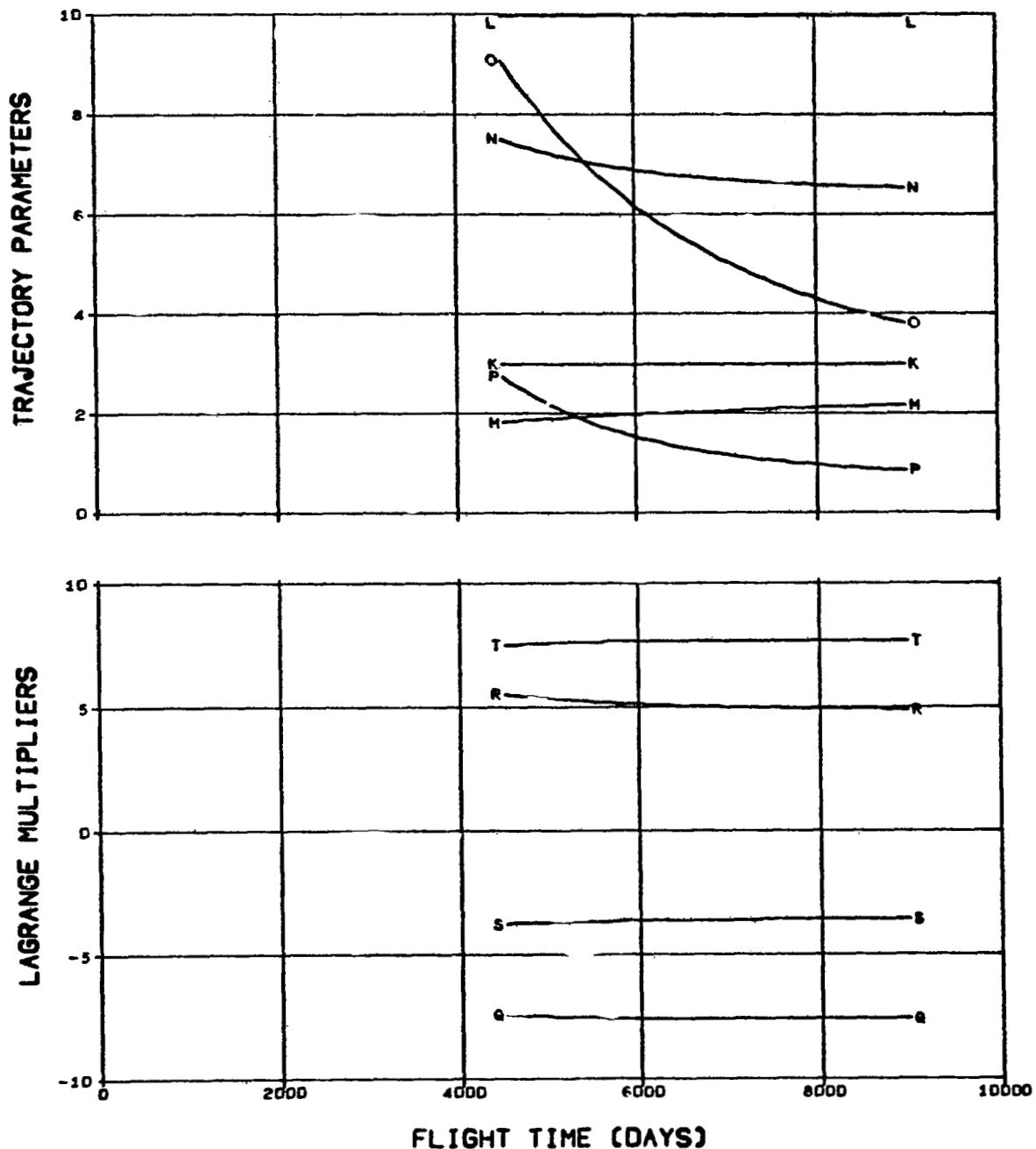
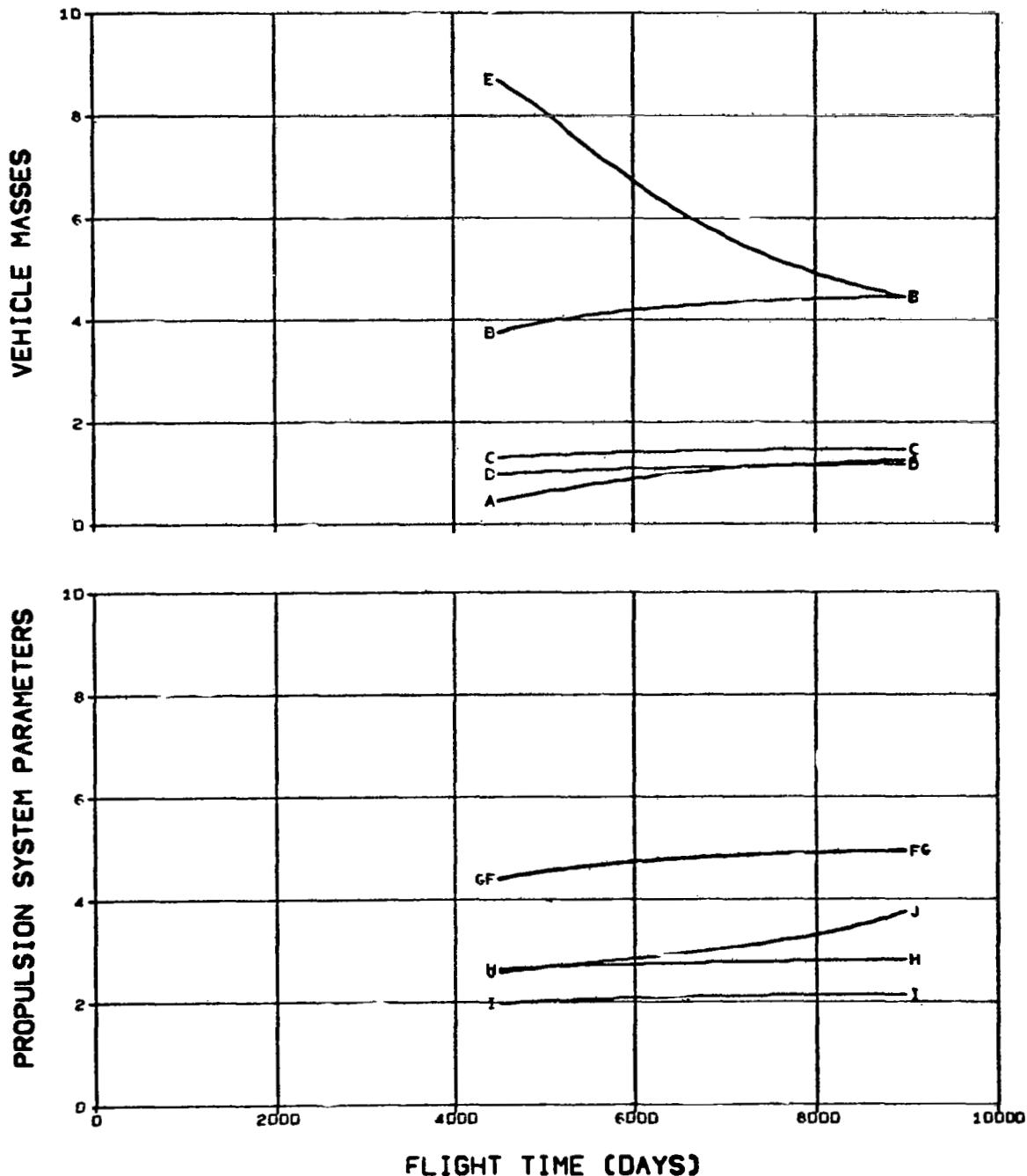


FIG. 8.4.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 8.4.2 NEPTUNE MODE A ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

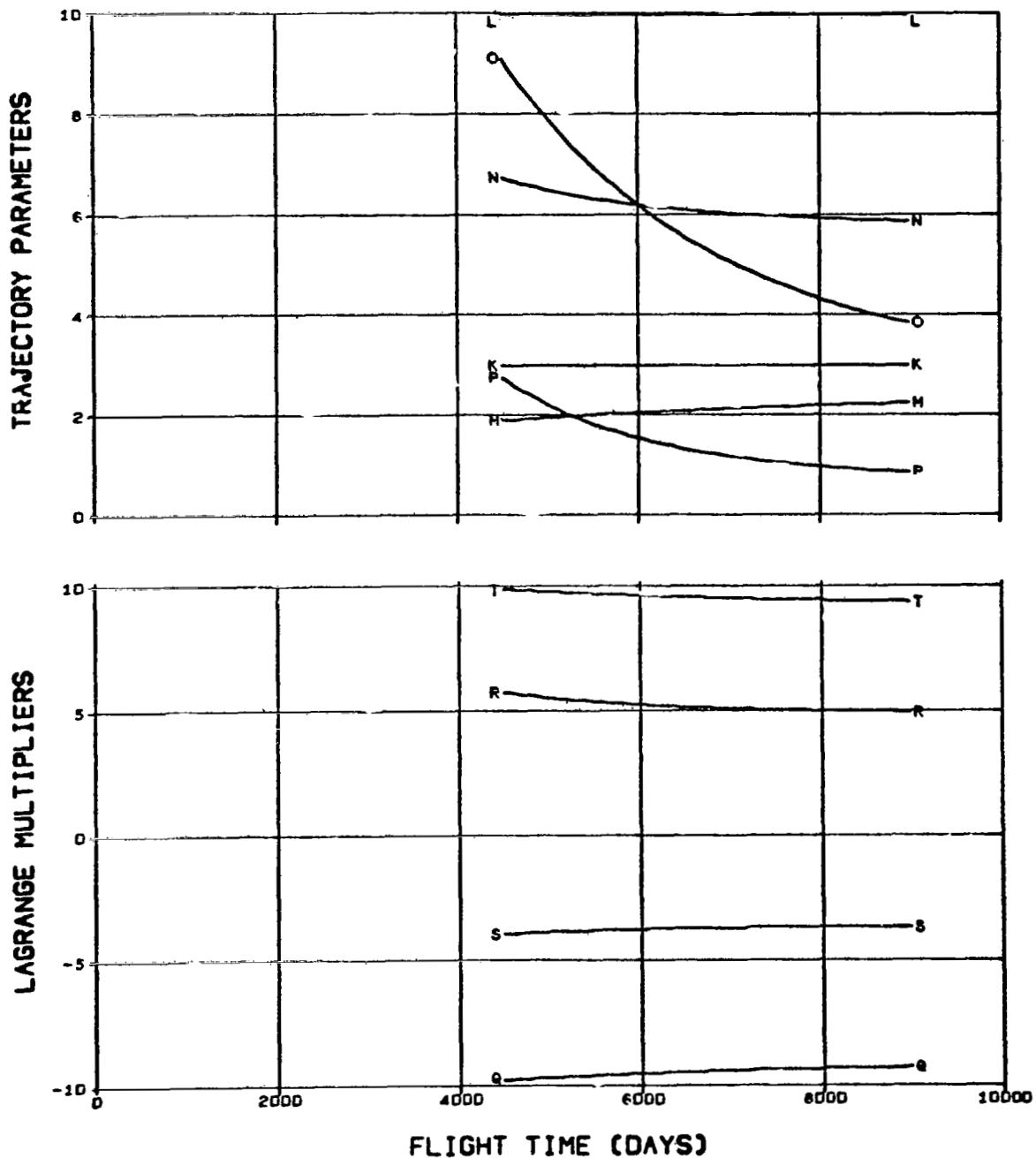
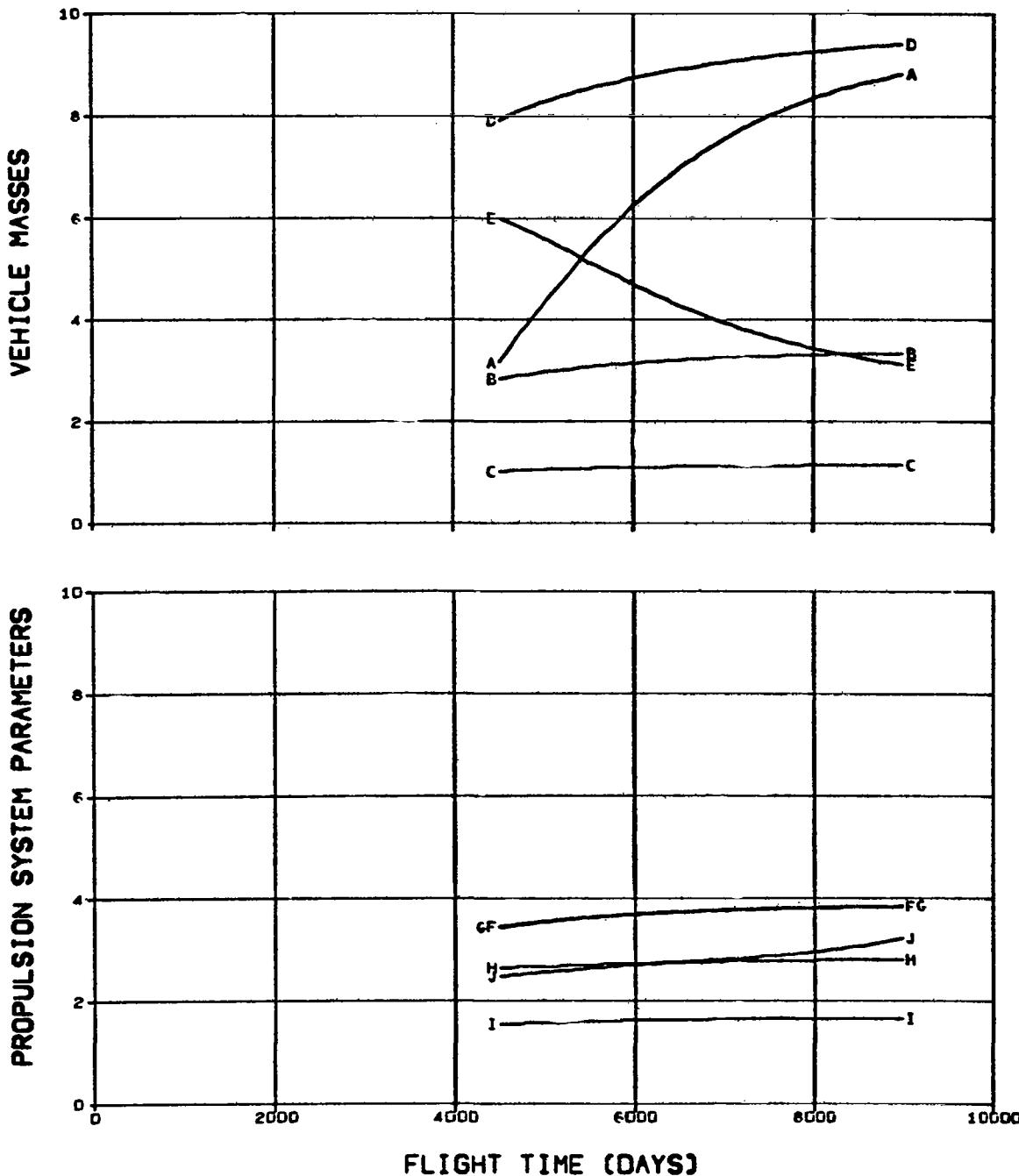


FIG. 8.4.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000



**FIG. 8.4.3 NEPTUNE MODE A ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)/10 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE

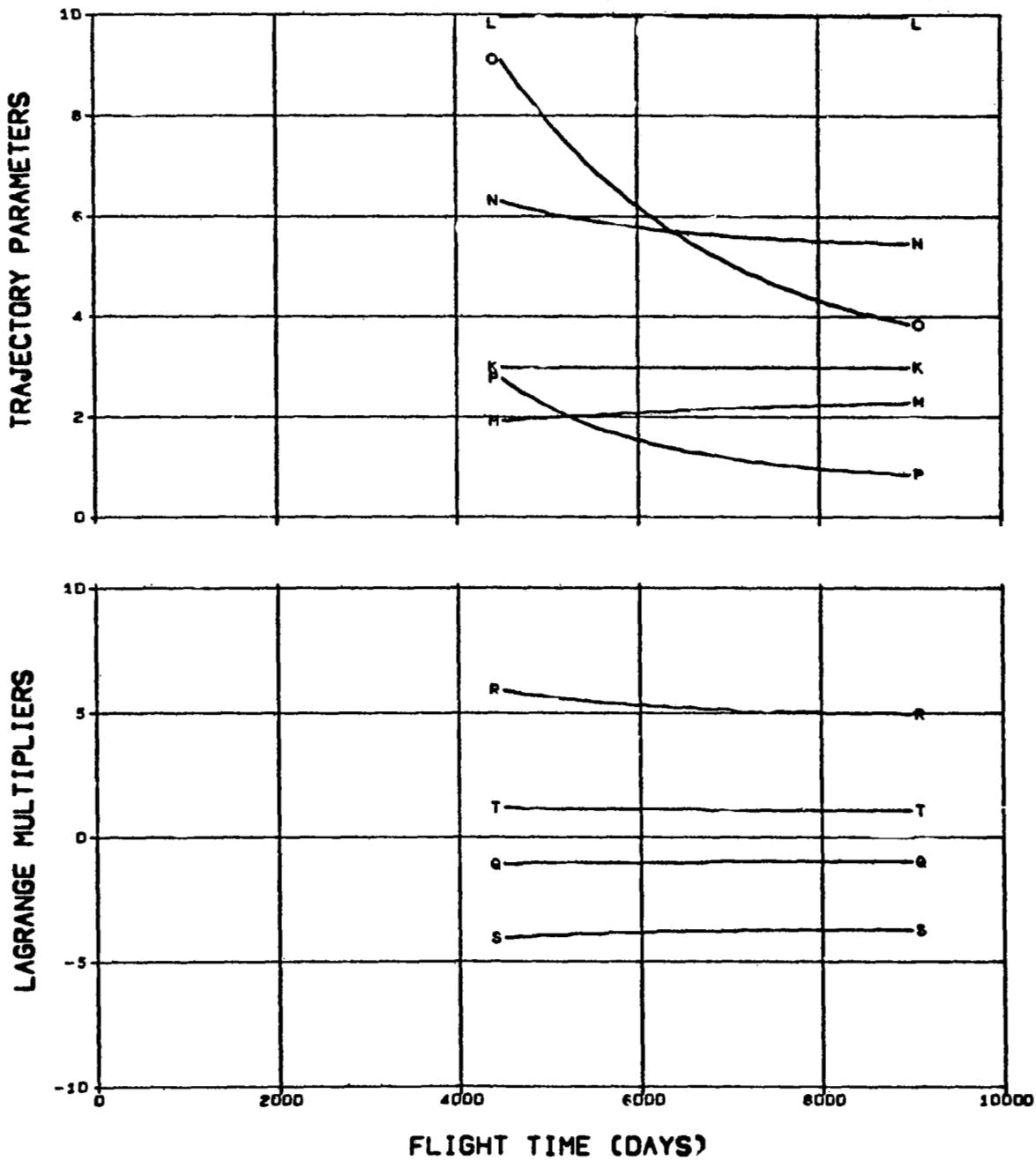
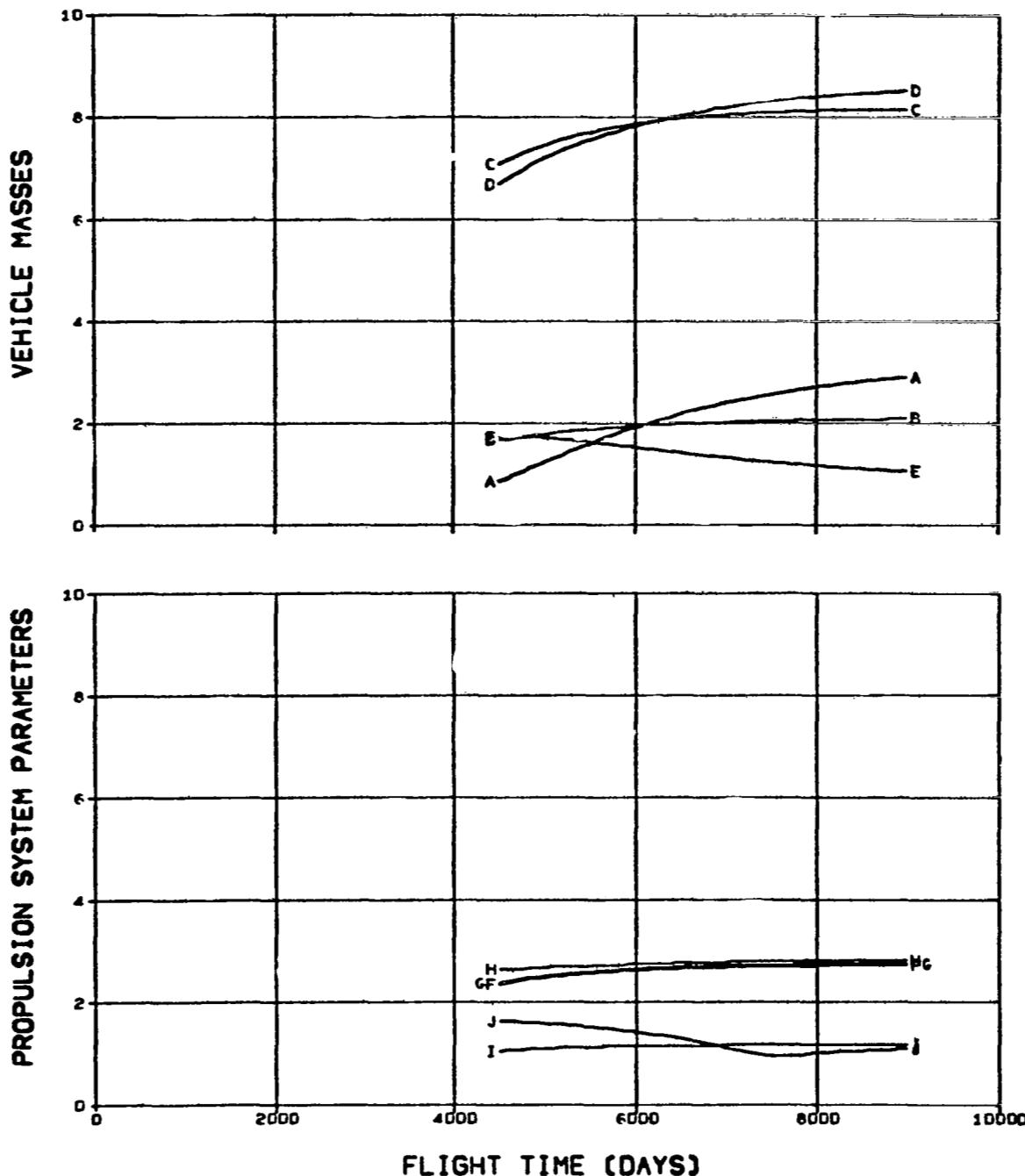


FIG. 8.4.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100	F POWER AT 1 AU (KW)/10
B INITIAL SPACECRAFT MASS (KG)/1000	G MAXIMUM POWER (KW)/10
C PROPULSION SYSTEM MASS (KG)/100	H JET EXHAUST SPEED (M/SEC)/10000
D PROPELLANT MASS (KG)/100	I THRUST AT 1 AU (N)
E RETRO PROPELLANT MASS (KG)/100	J PROPULSION TIME (DAYS)/1000



**FIG. 8.4.4 NEPTUNE MODE A ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

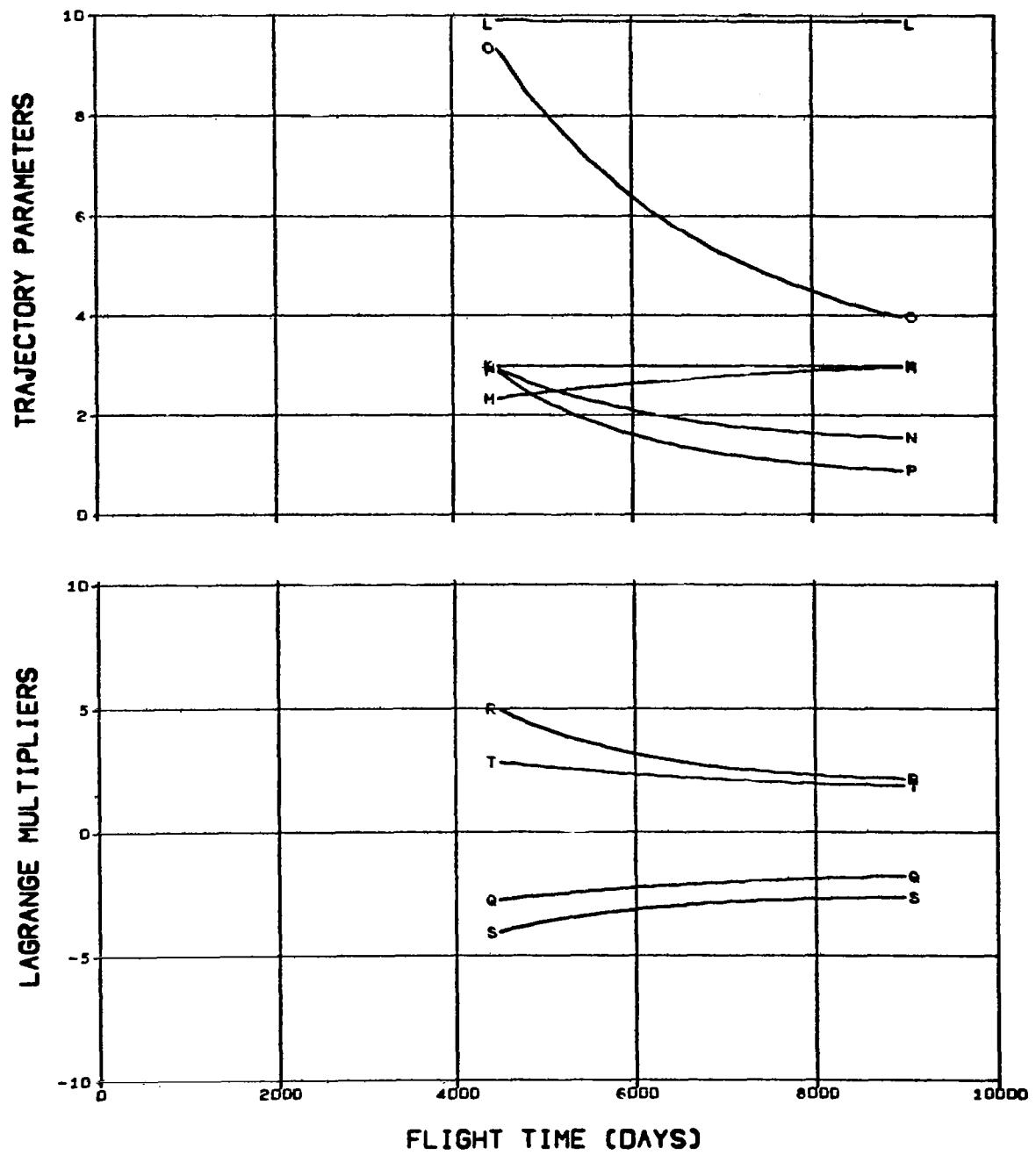
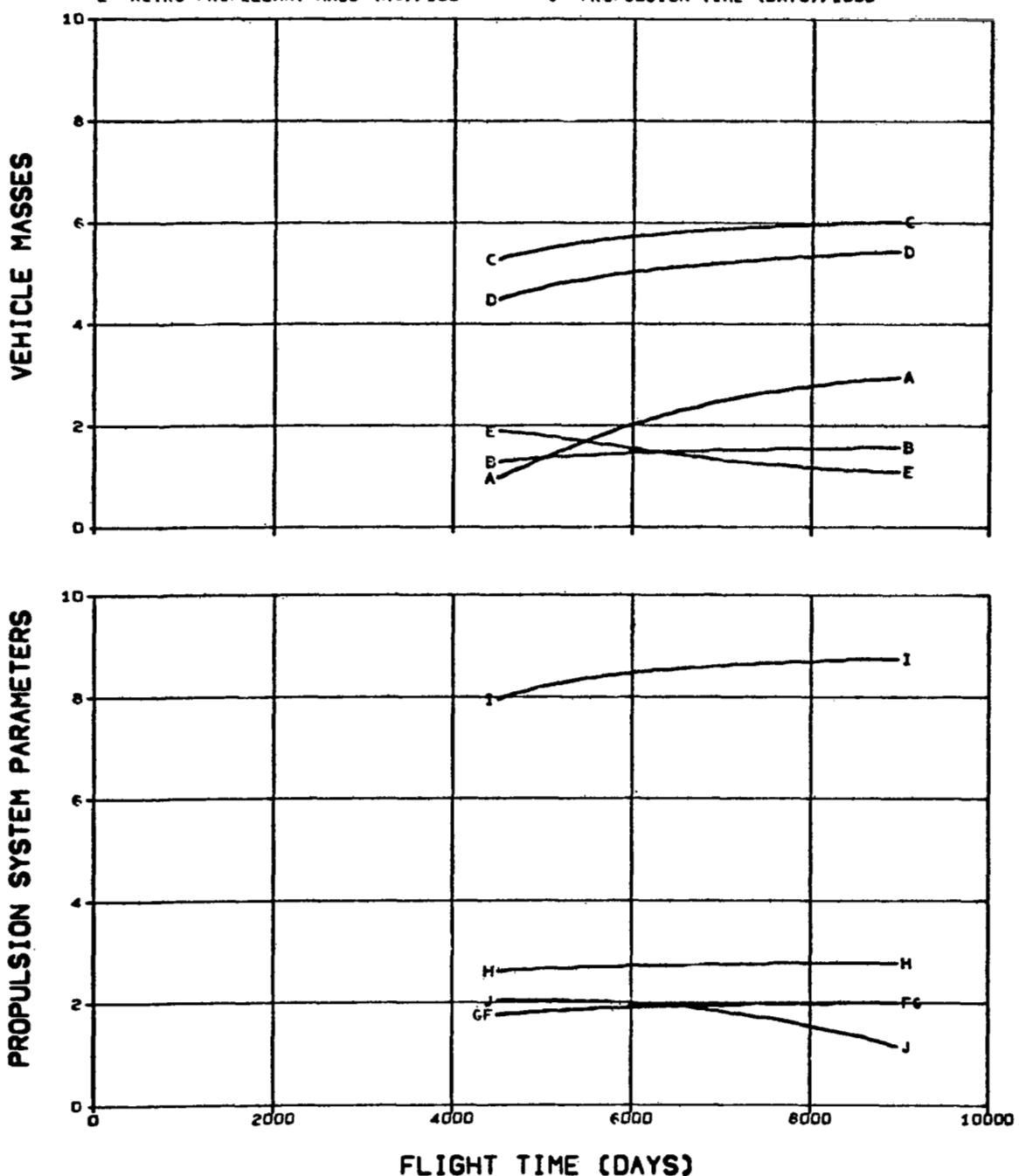


FIG. 8.4.4 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.0DE-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLION TIME (DAYS)/1000



**FIG. 8.4.5 NEPTUNE MODE A ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.0DE-1	Q	X-COMPONENT OF PRIMER
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE

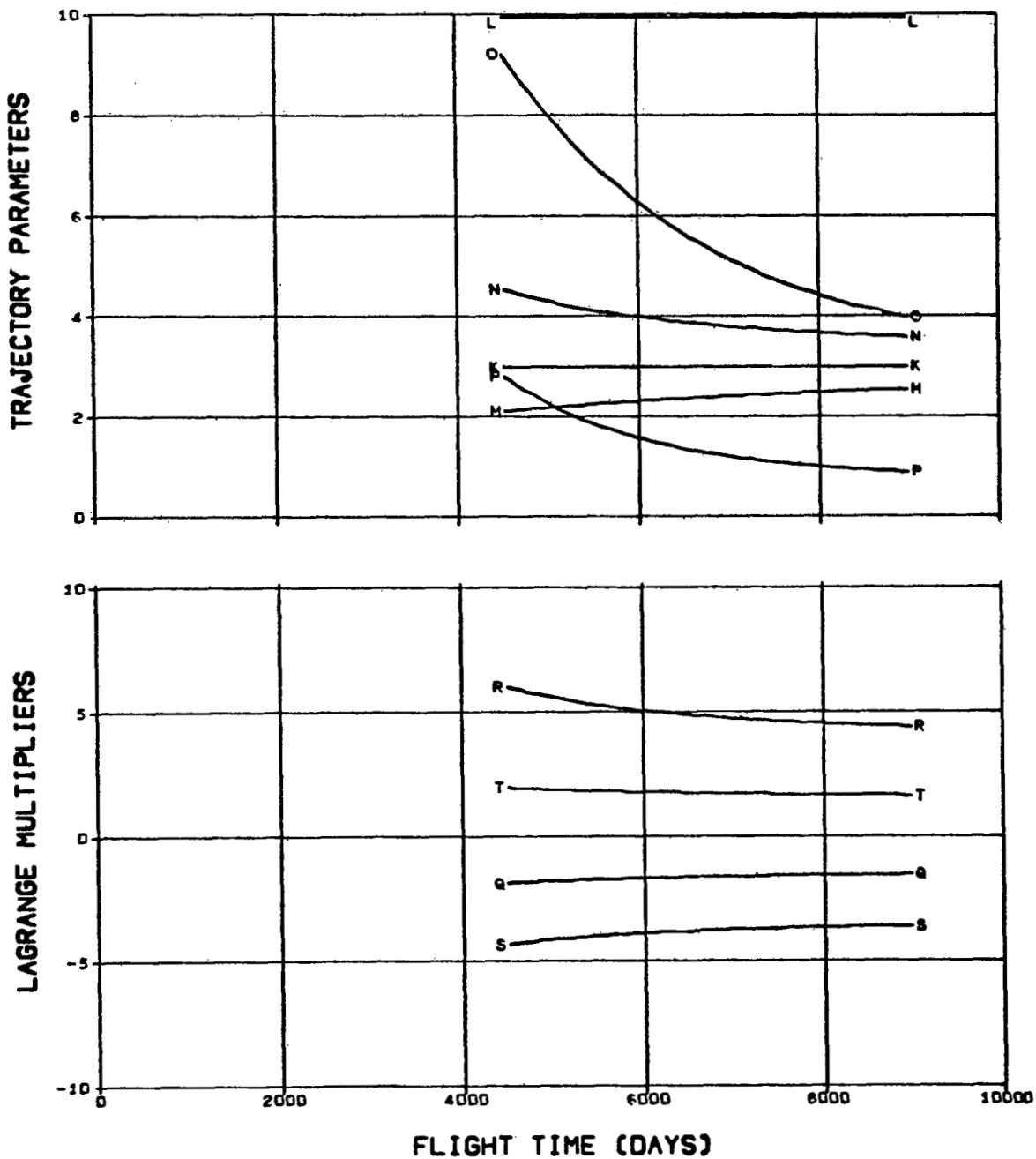


FIG. 8.4.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

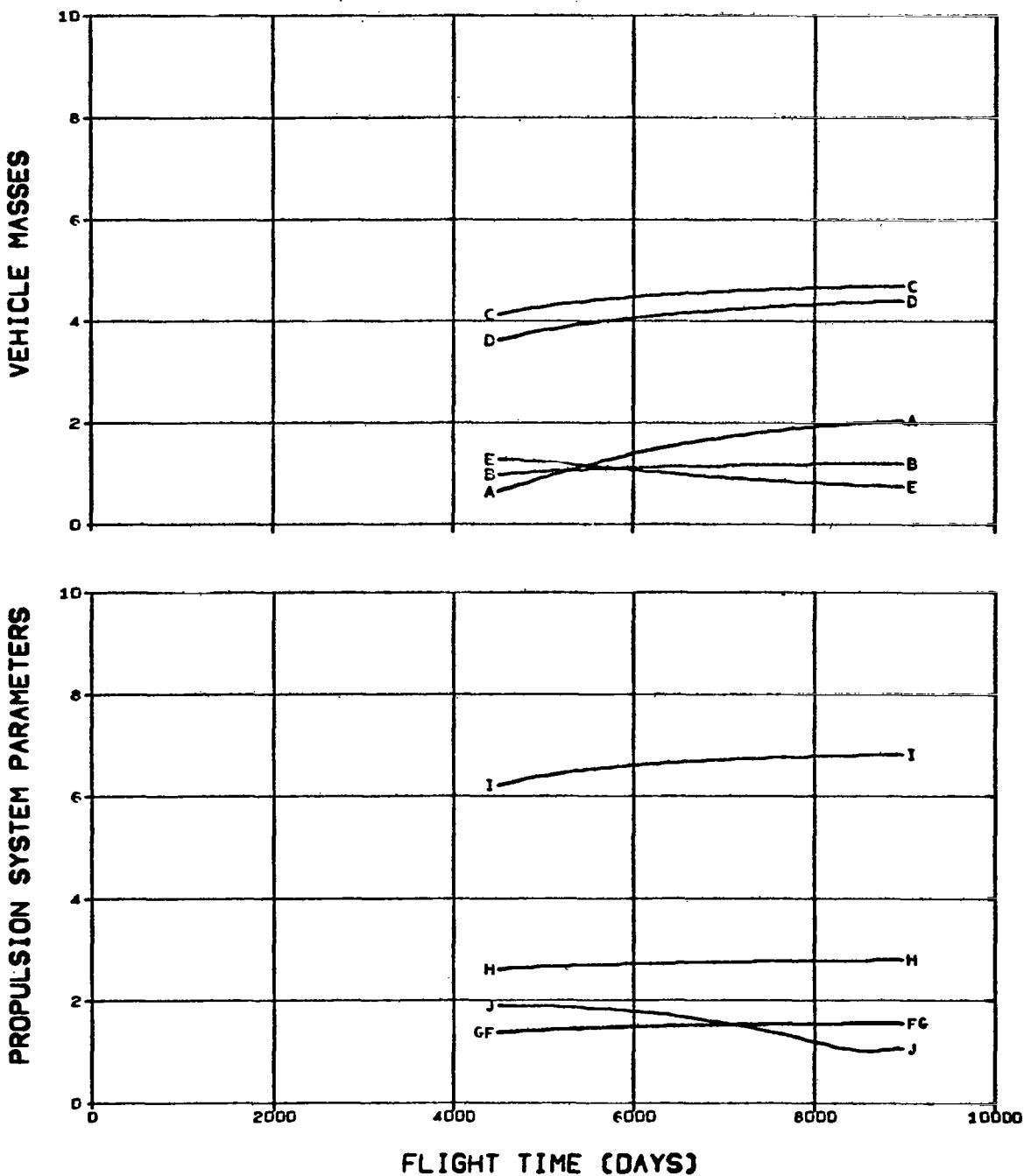


FIG. 8.4.6 NEPTUNE MODE A ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q X-COMPONENT OF PRIMER
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/1000 T Y-COMPONENT OF PRIMER DERIVATIVE

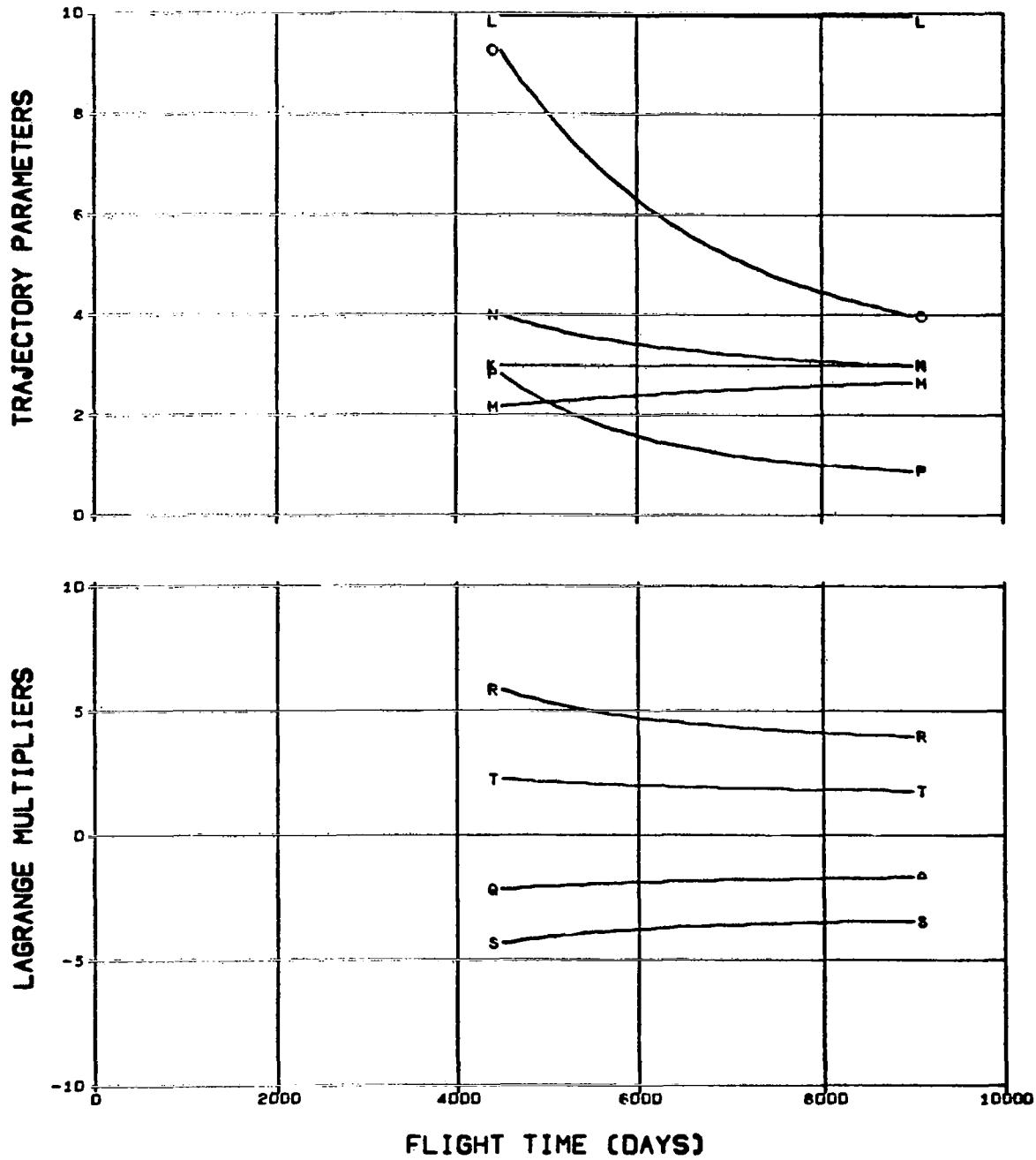
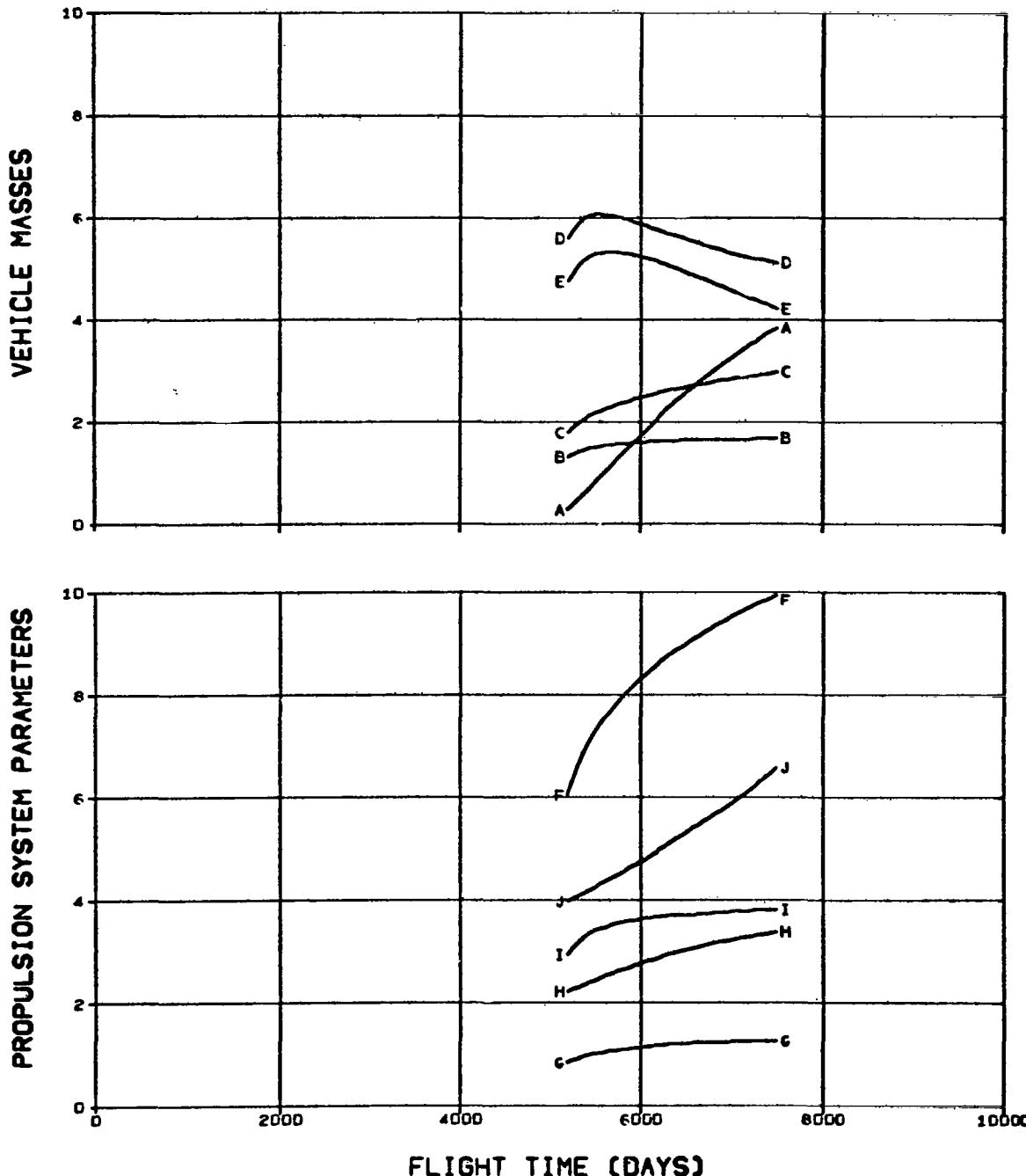


FIG. 8.4.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLSION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/1000



**FIG. 8.5.1 NEPTUNE MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

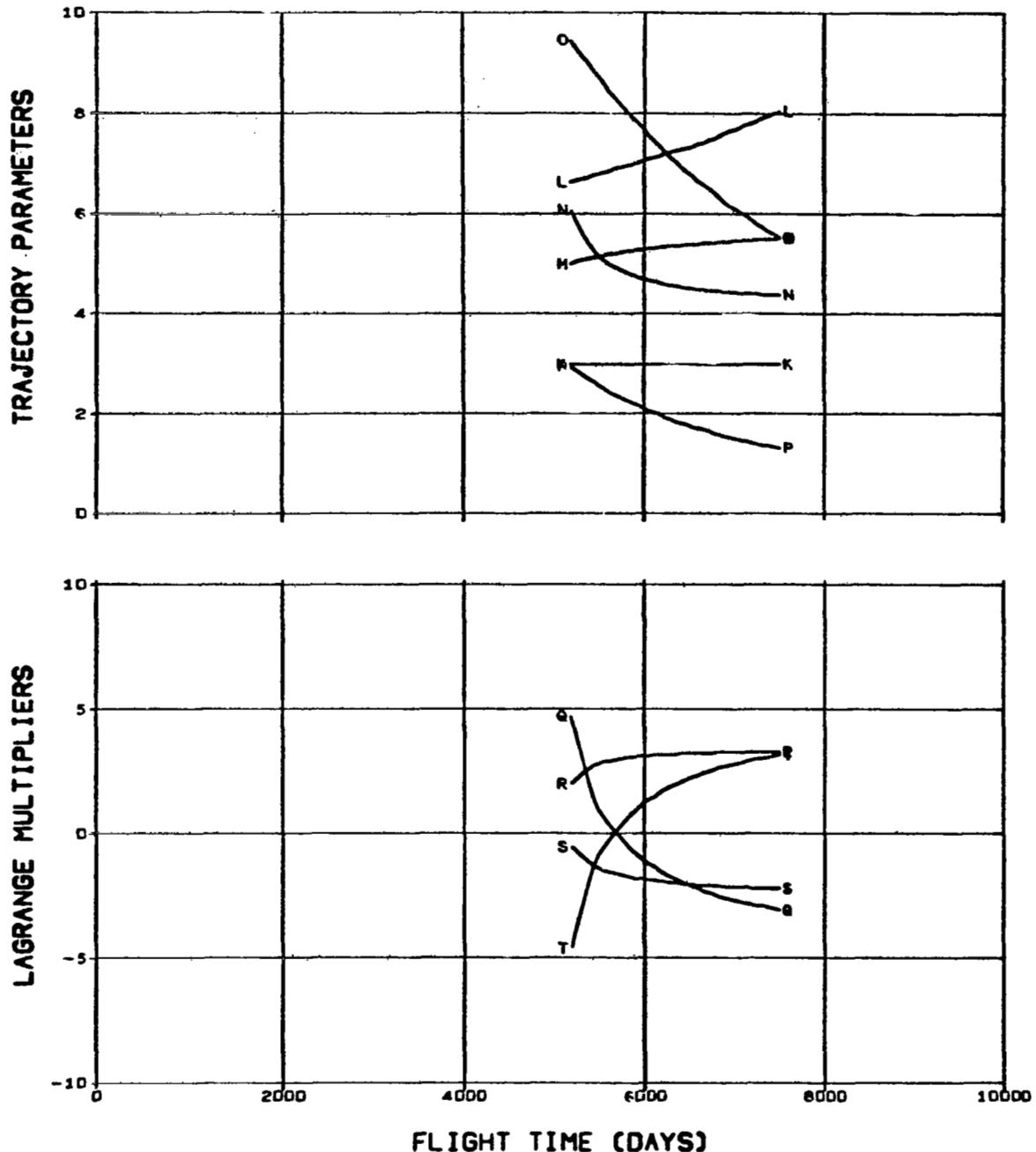
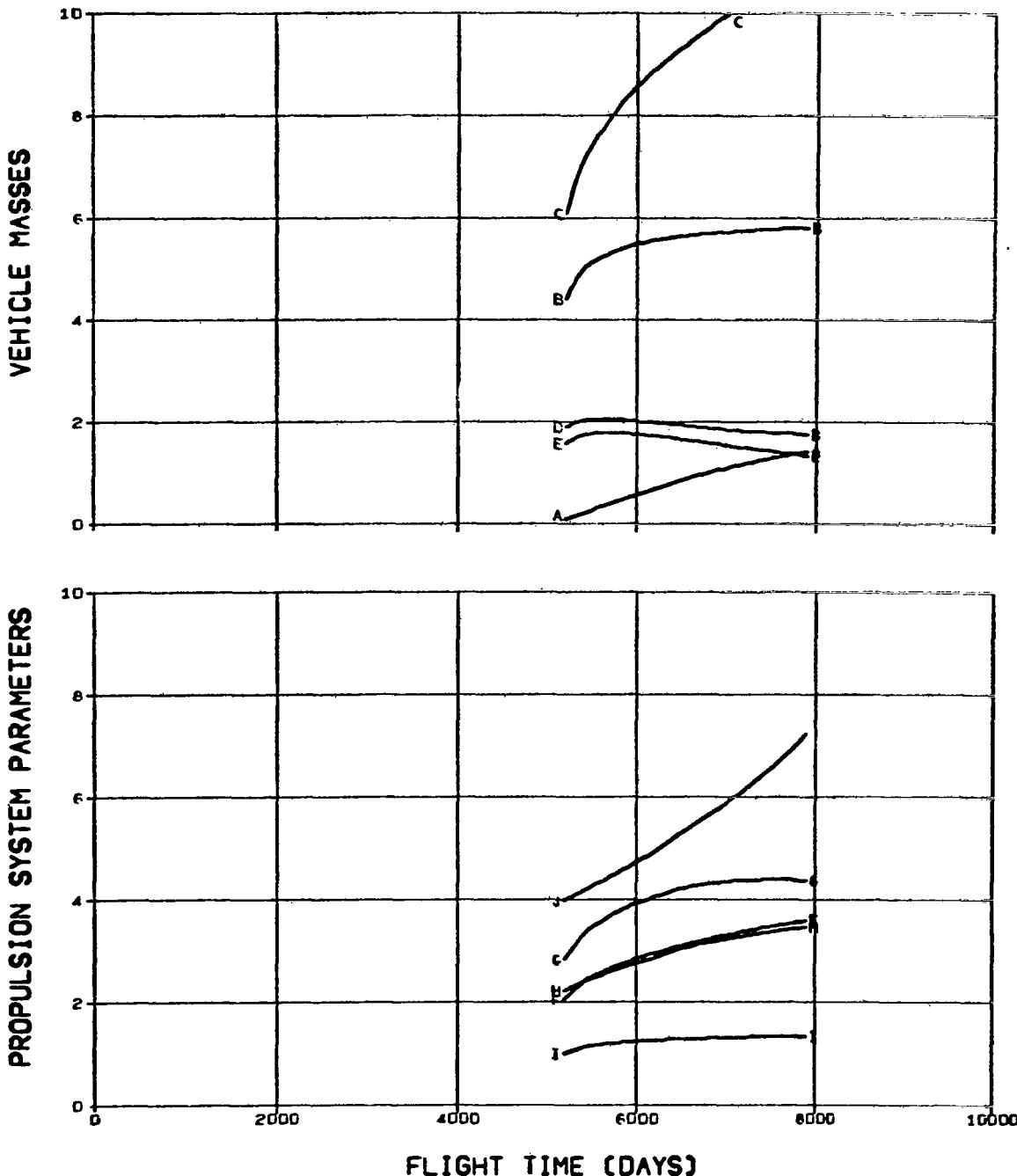


FIG. 8.5.1 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1' AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 8.5.2 NEPTUNE MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.00E-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.00E-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

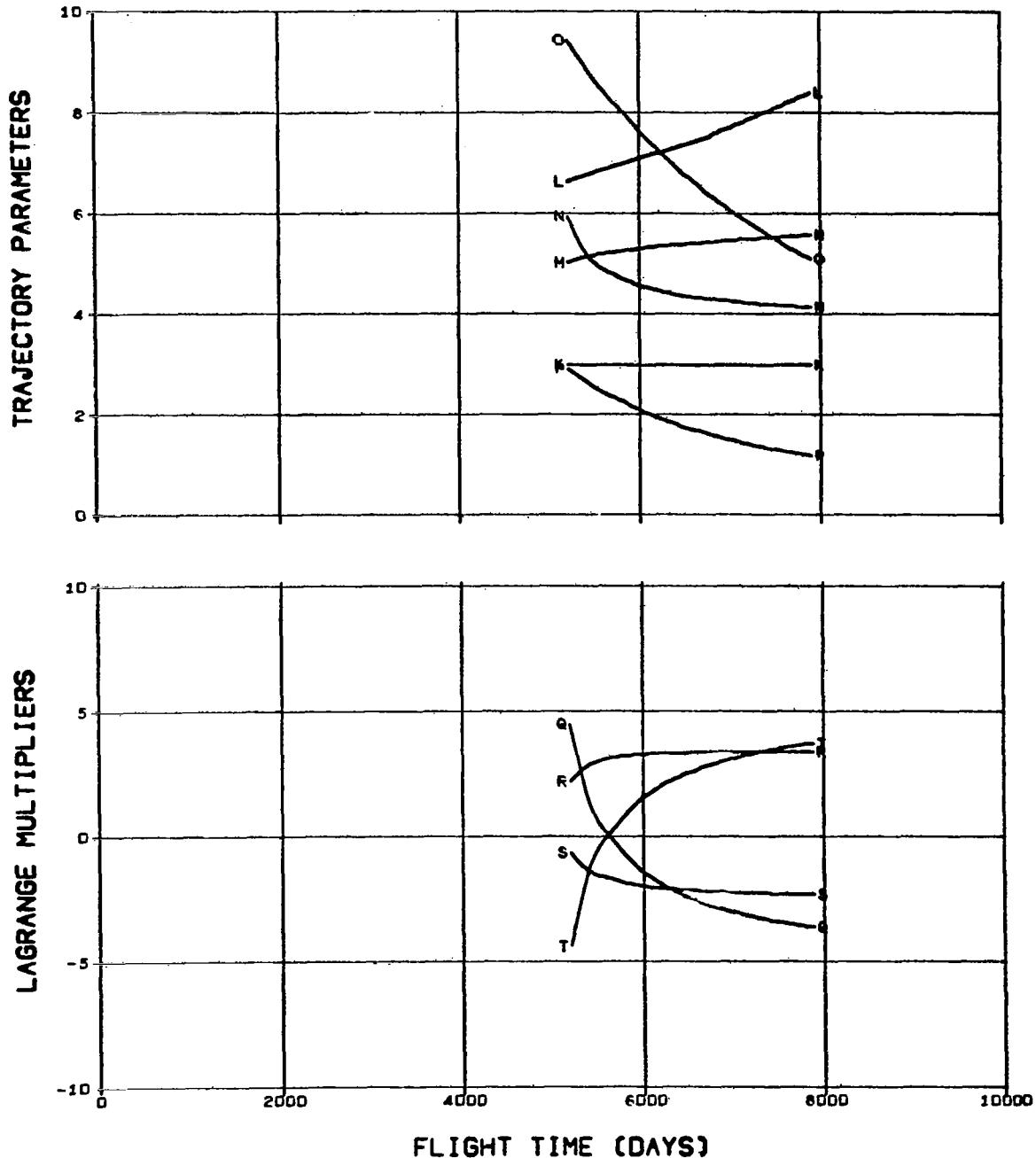


FIG. 8.5.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000

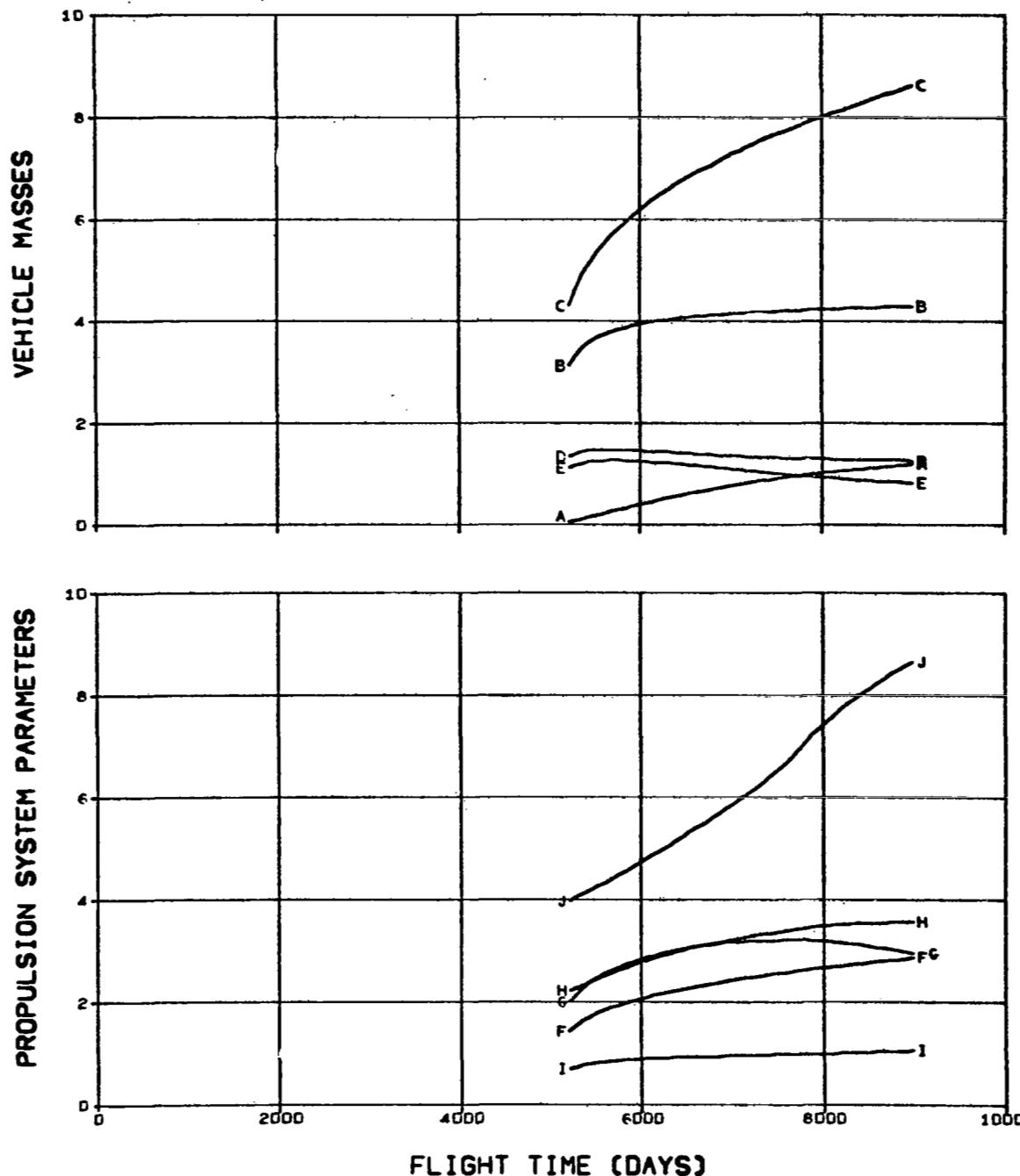


FIG. 8.5.3 NEPTUNE MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPELLION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

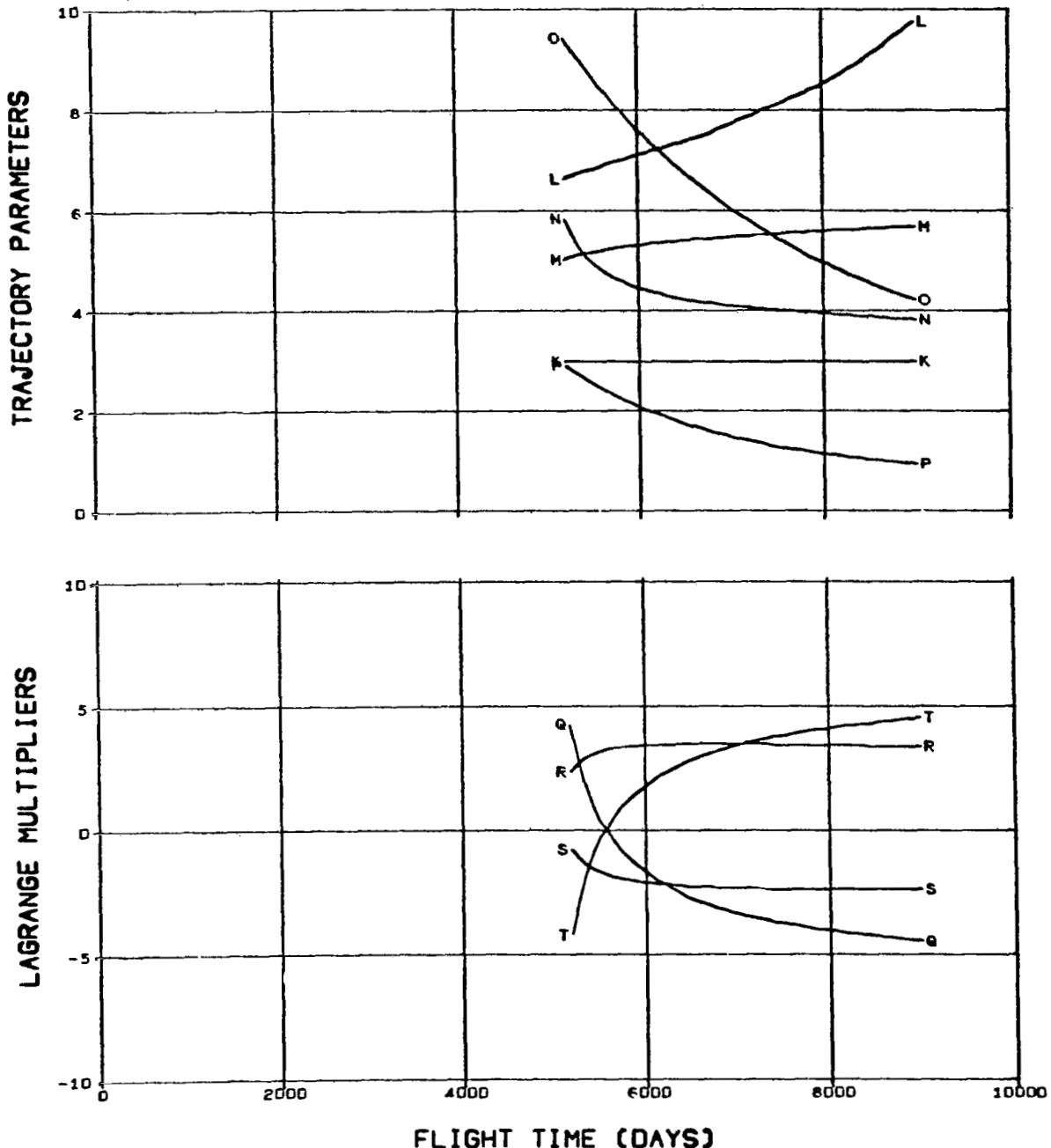


FIG. 8.5.3 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/1000

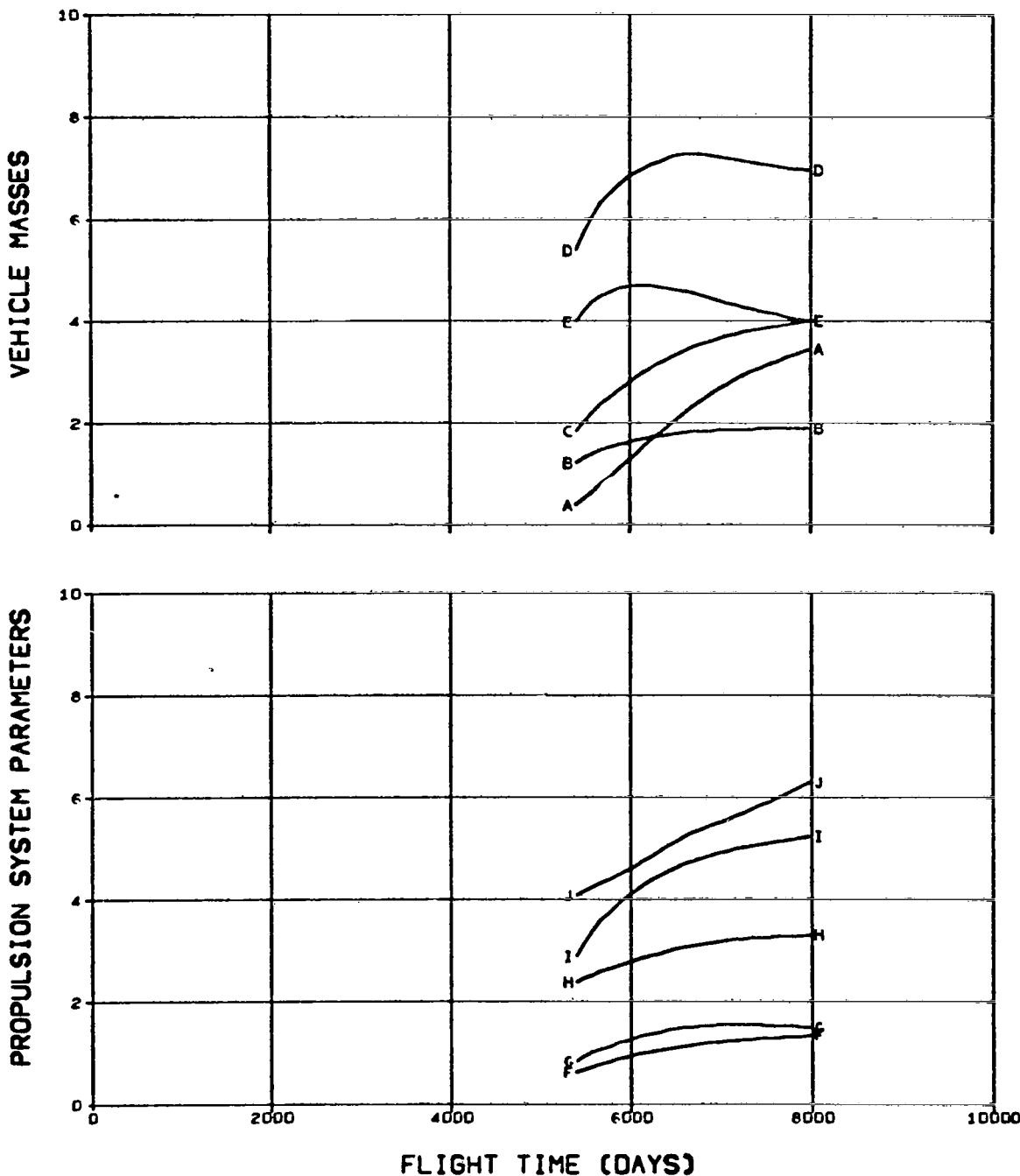


FIG. 8.5.4 NEPTUNE MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	P	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	Q	X-COMPONENT OF PRIMER/1.D0E-1
M	HELIOPHILIC TRAVEL ANGLE (DEG)/100	R	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	S	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/1000	T	Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

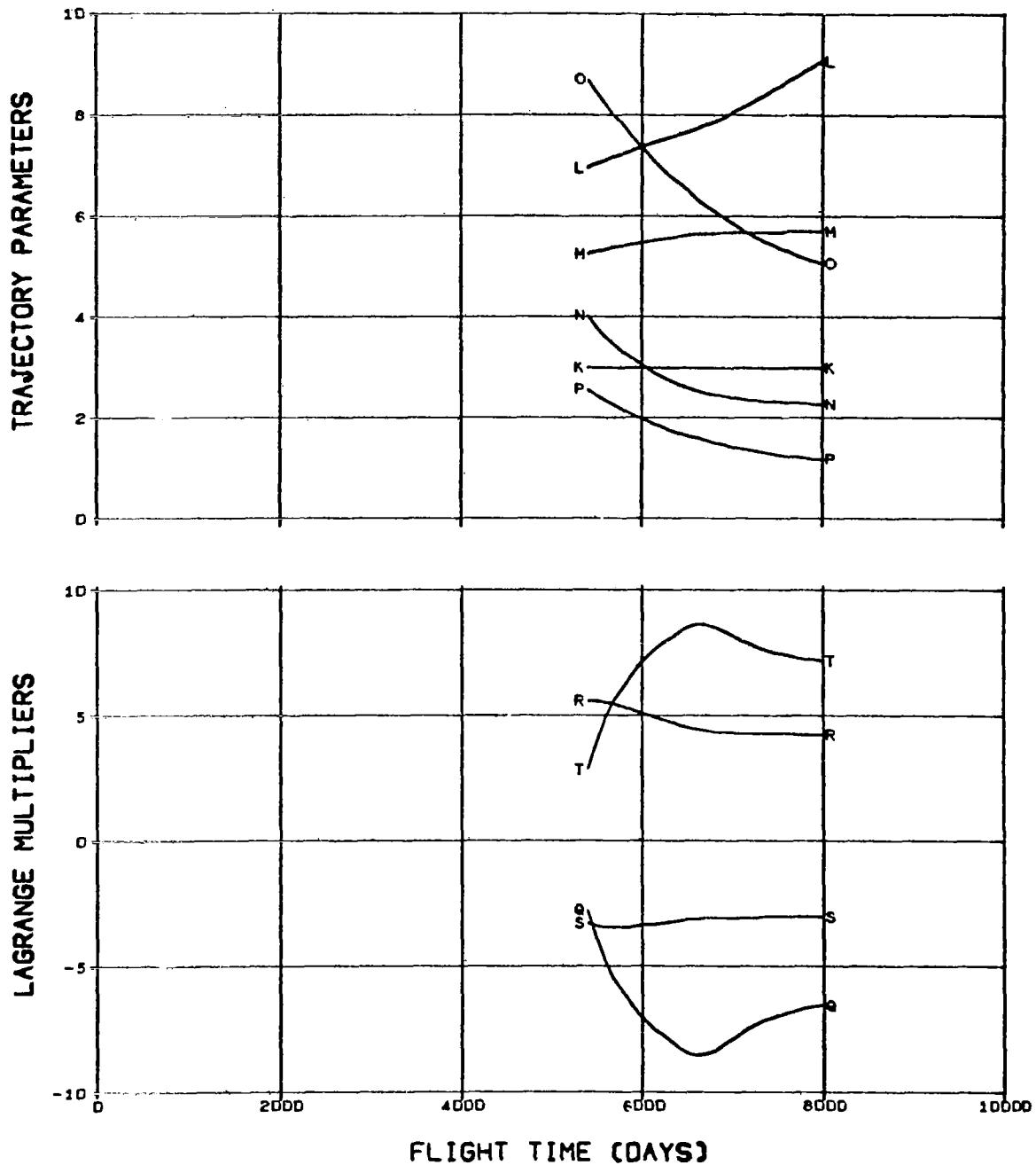


FIG. 8.5.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.0DE-1
 J PROPULSION TIME (DAYS)/1000

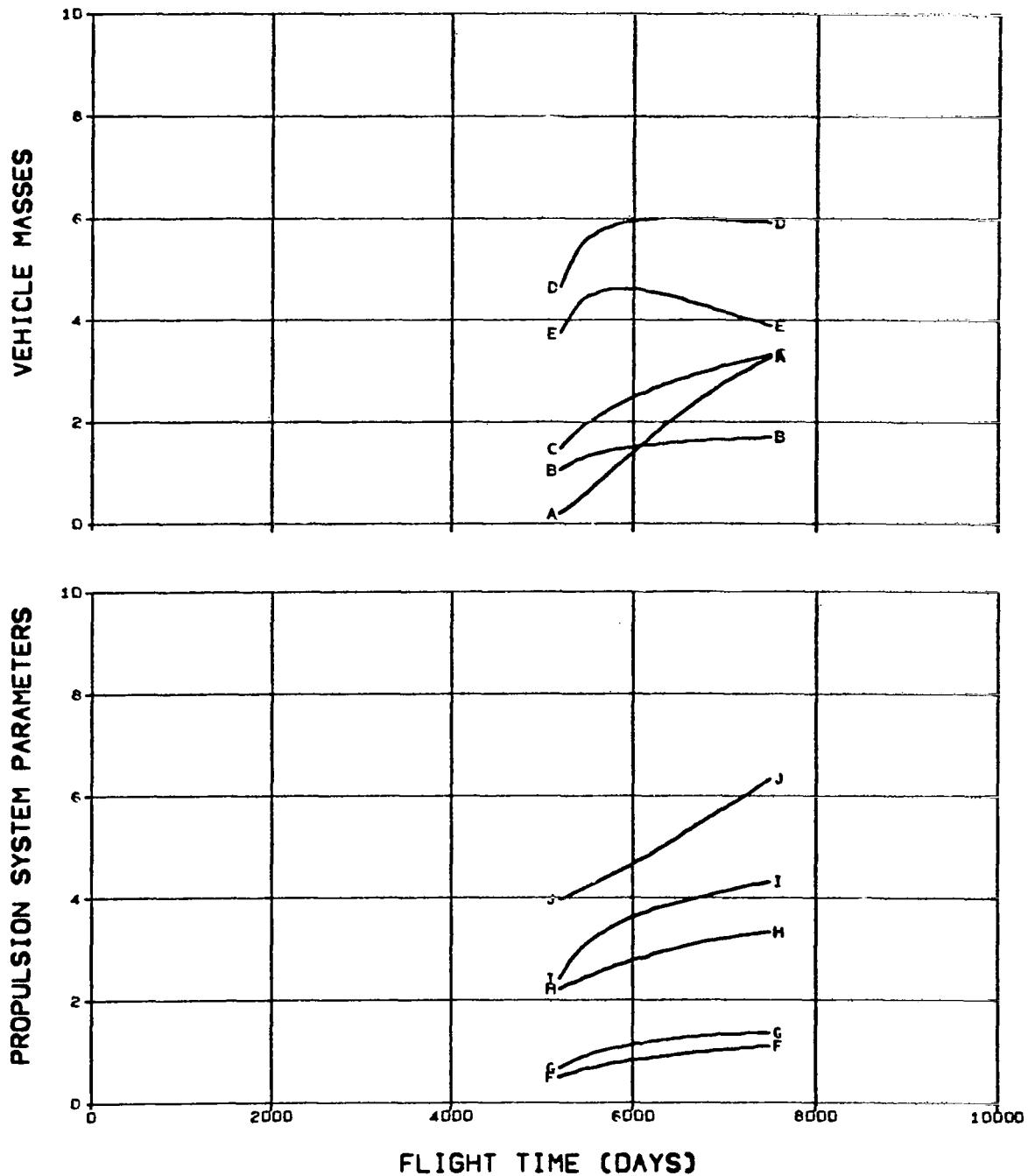


FIG. 8.5.5 NEPTUNE MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

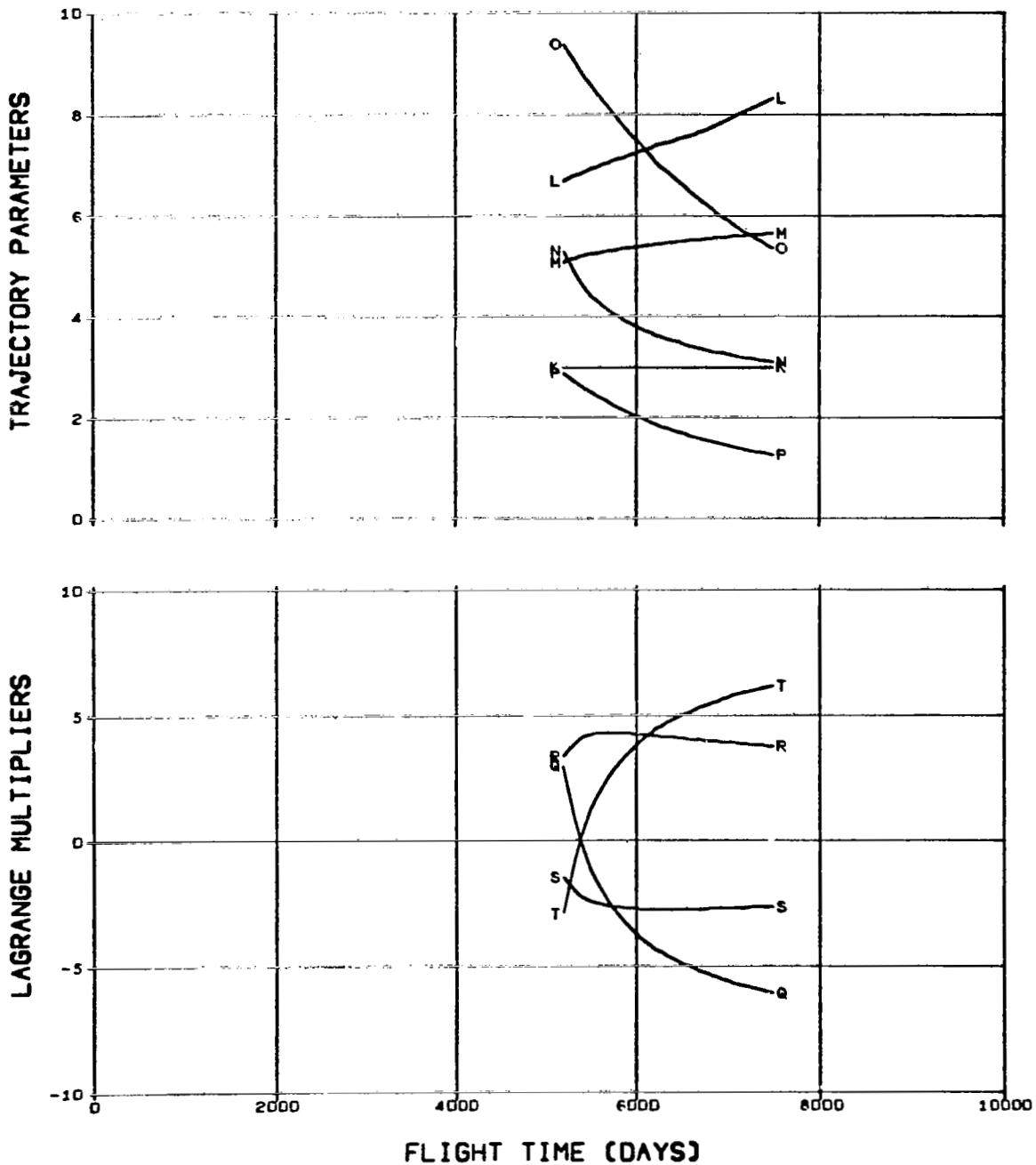


FIG. 8.5.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)
C	PROPULSION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLUTION TIME (DAYS)/1000

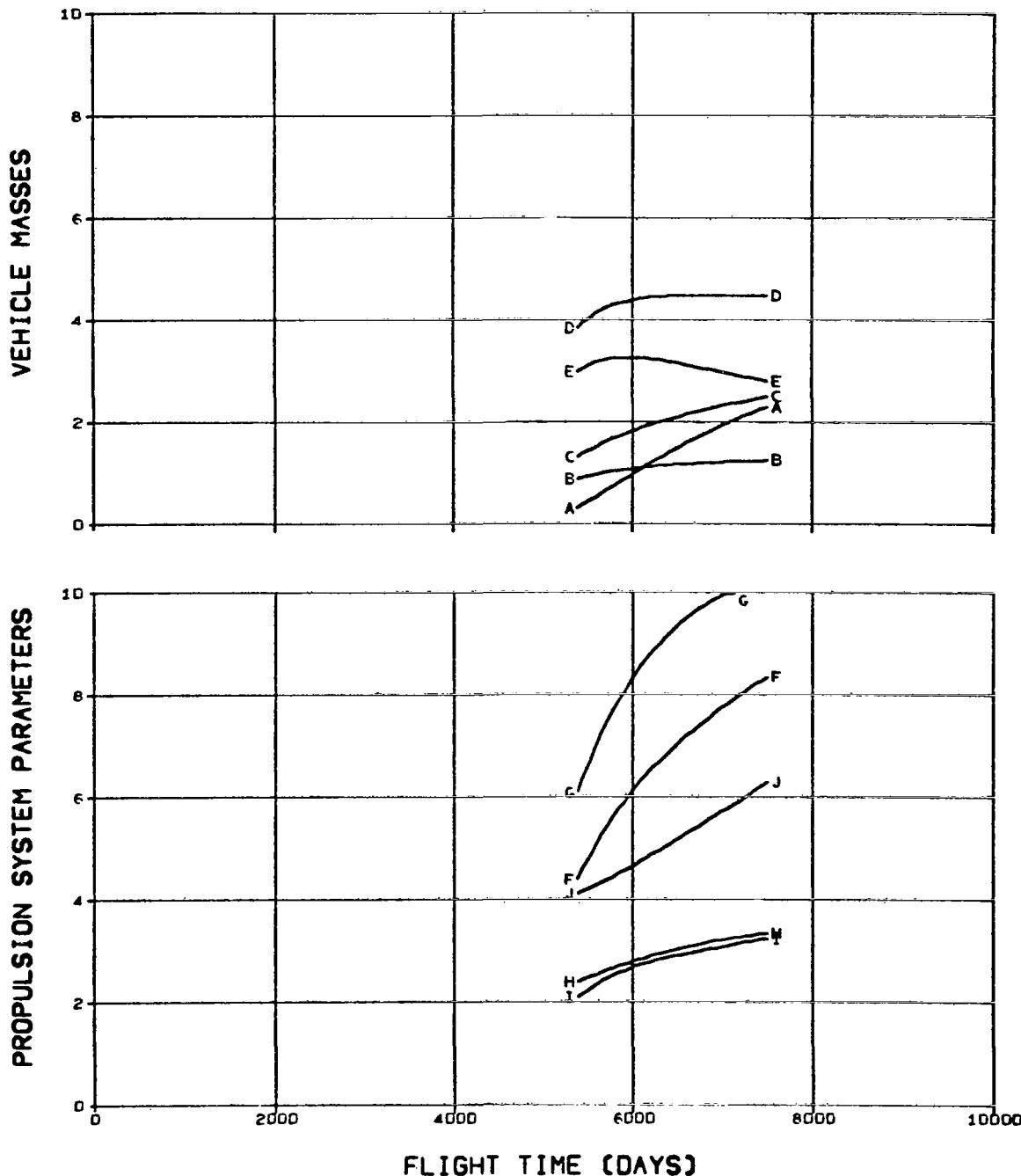


FIG. 8.5.6 NEPTUNE MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM NOT JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/1000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

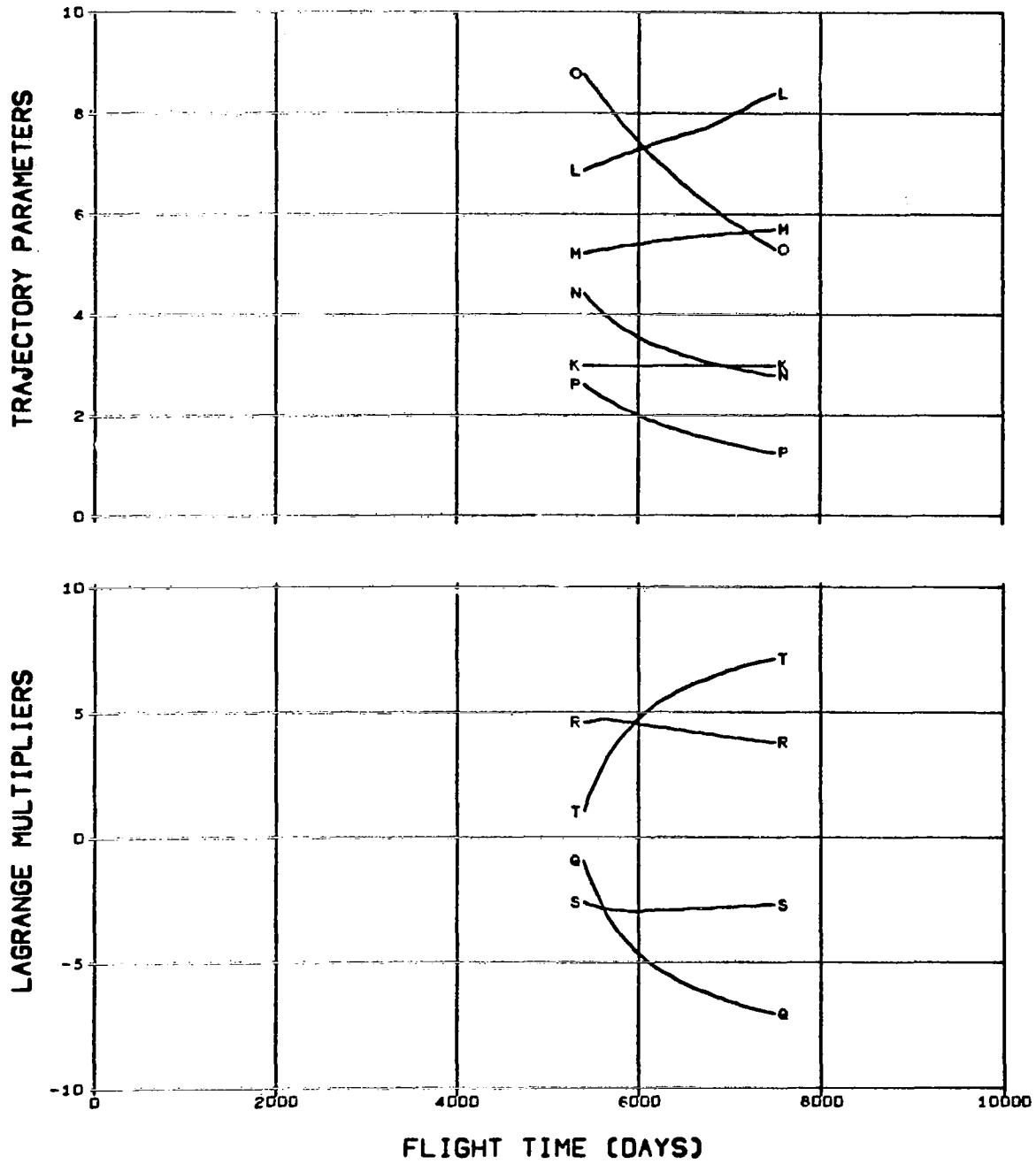


FIG. 8.5.6 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/100
B	INITIAL SPACECRAFT MASS (KG)/10000	G	MAXIMUM POWER (KW)/100
C	PROPELLUTION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPELLUTION TIME (DAYS)/1000

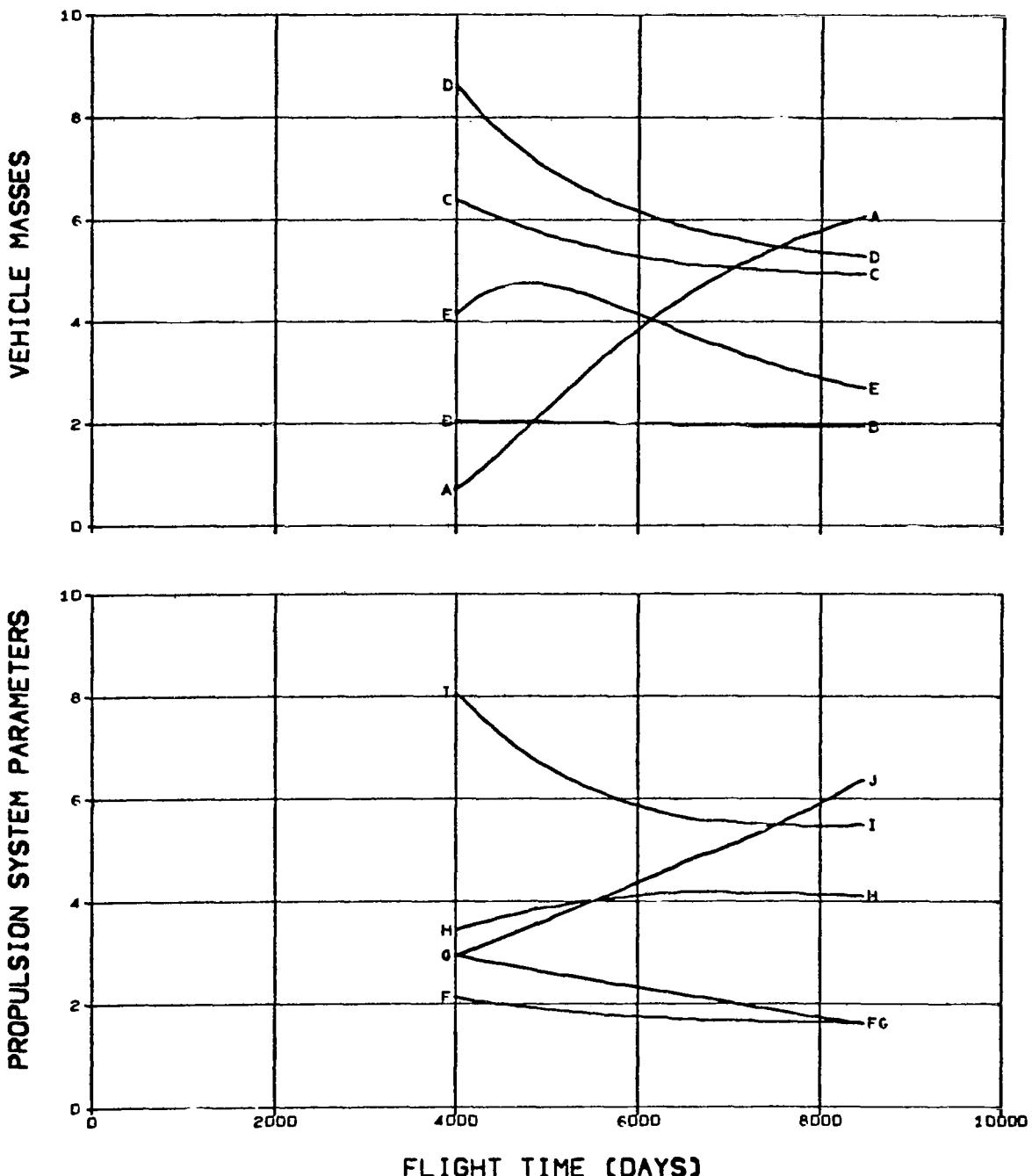


FIG. 8.6.1 NEPTUNE MODE B ORBITER MISSIONS
SATURN IC/SIVB/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1 Q X-COMPONENT OF PRIMER/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R Y-COMPONENT OF PRIMER
 N LAUNCH EXCESS SPEED (M/SEC)/1000 S X-COMPONENT OF PRIMER DERIVATIVE
 O ARRIVAL EXCESS SPEED (M/SEC)/10000 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

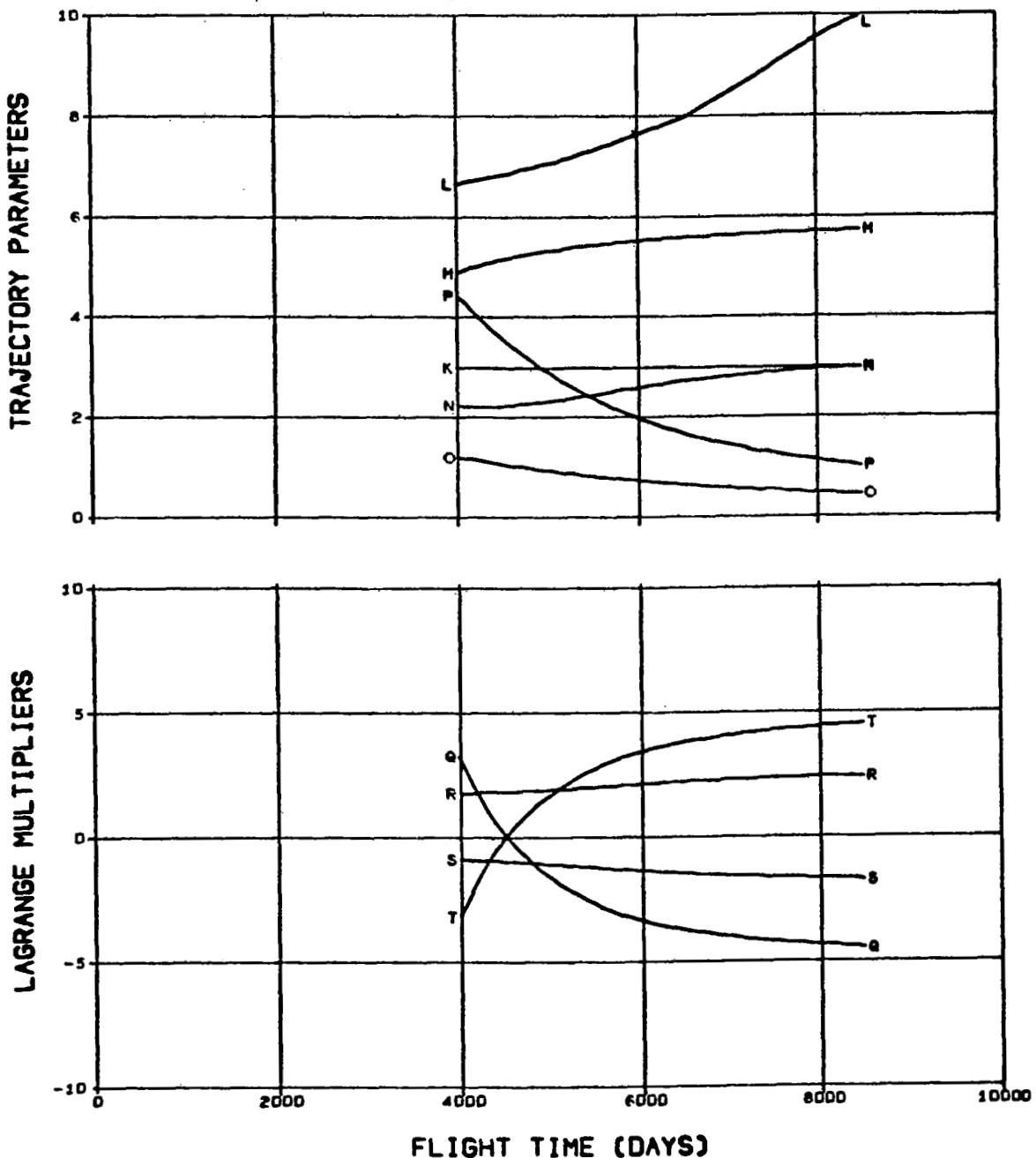


FIG. 8.6.1 (CONCLUDED)

A. NET SPACECRAFT MASS (KG)/1000	F. POWER AT 1 AU (KW)/10
B. INITIAL SPACECRAFT MASS (KG)/1000	G. MAXIMUM POWER (KW)/10
C. PROPULSION SYSTEM MASS (KG)/1000	H. JET EXHAUST SPEED (M/SEC)/10000
D. PROPELLANT MASS (KG)/1000	I. THRUST AT 1 AU (N)
E. RETRO PROPELLANT MASS (KG)/1000	J. PROPULSION TIME (DAYS)/1000

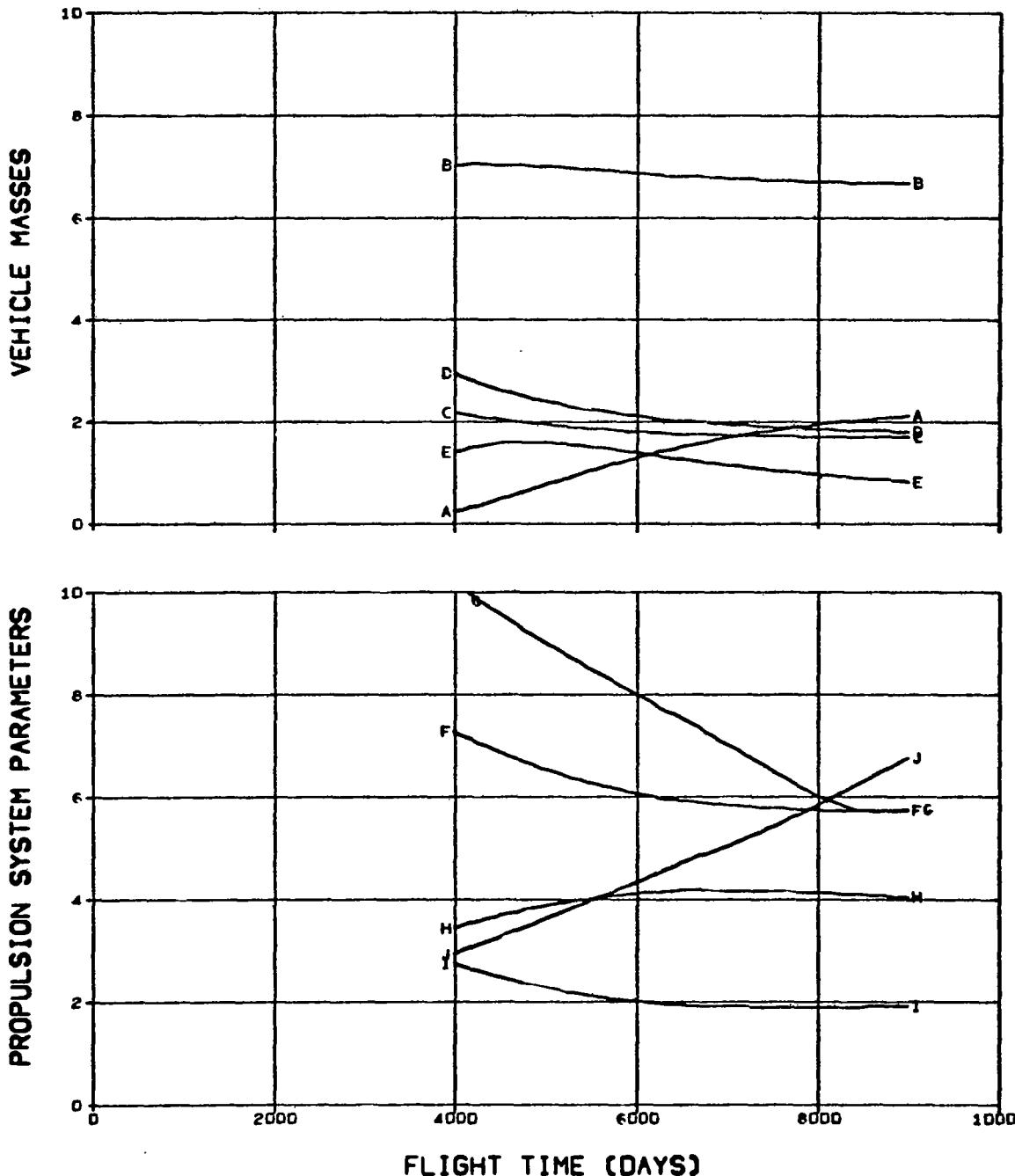


FIG. 8.6.2 NEPTUNE MODE B ORBITER MISSIONS
TITAN III X(1207)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K	MAXIMUM SOLAR DISTANCE (AU)/10	Q	RETRO INCREMENTAL SPEED (M/SEC)/1000
L	MINIMUM SOLAR DISTANCE (AU)/1.00E-1	R	X-COMPONENT OF PRIMER/1.00E-1
M	HELIOPARTRIC TRAVEL ANGLE (DEG)/100	S	Y-COMPONENT OF PRIMER
N	LAUNCH EXCESS SPEED (M/SEC)/1000	T	X-COMPONENT OF PRIMER DERIVATIVE
O	ARRIVAL EXCESS SPEED (M/SEC)/10000		Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

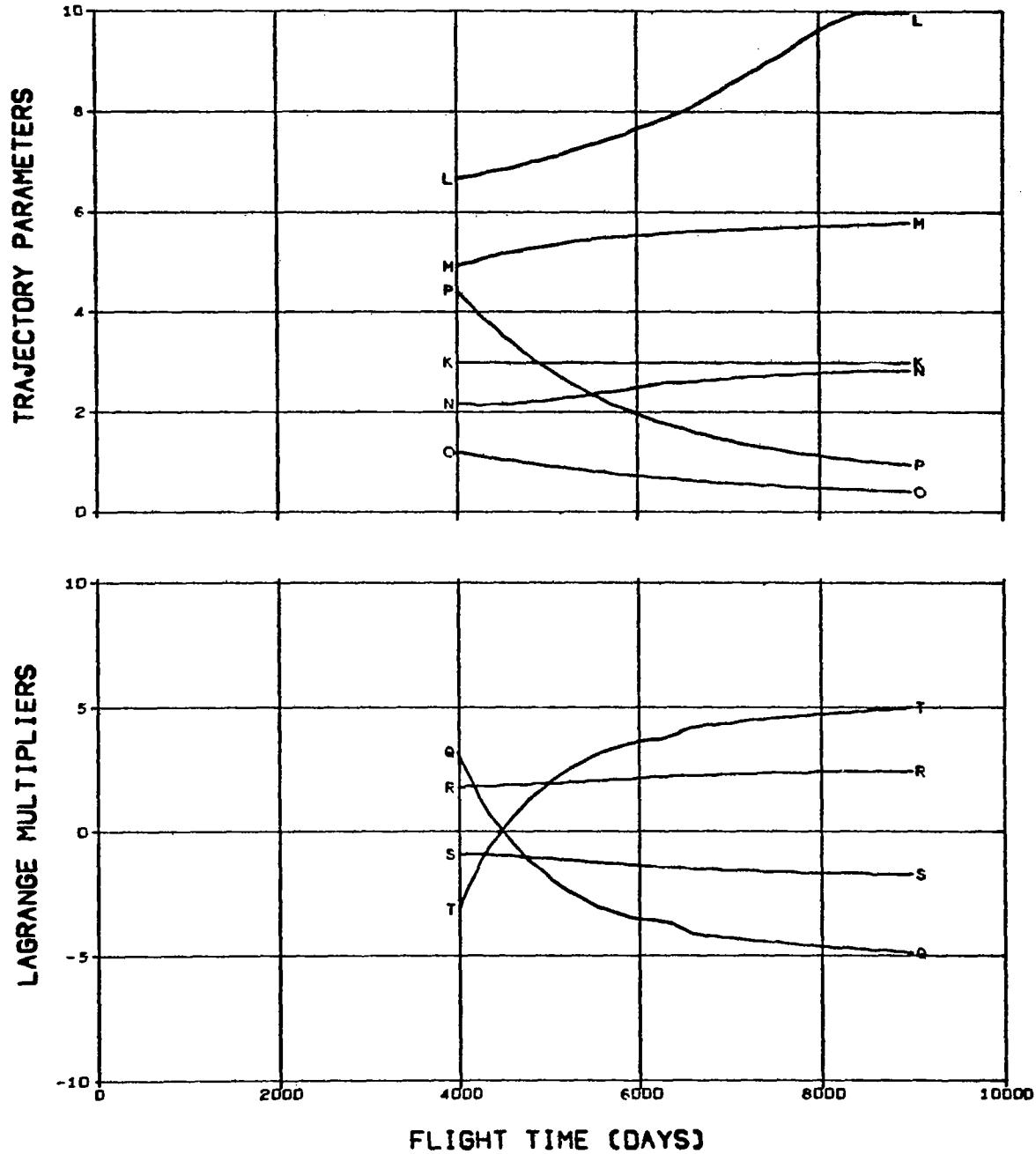
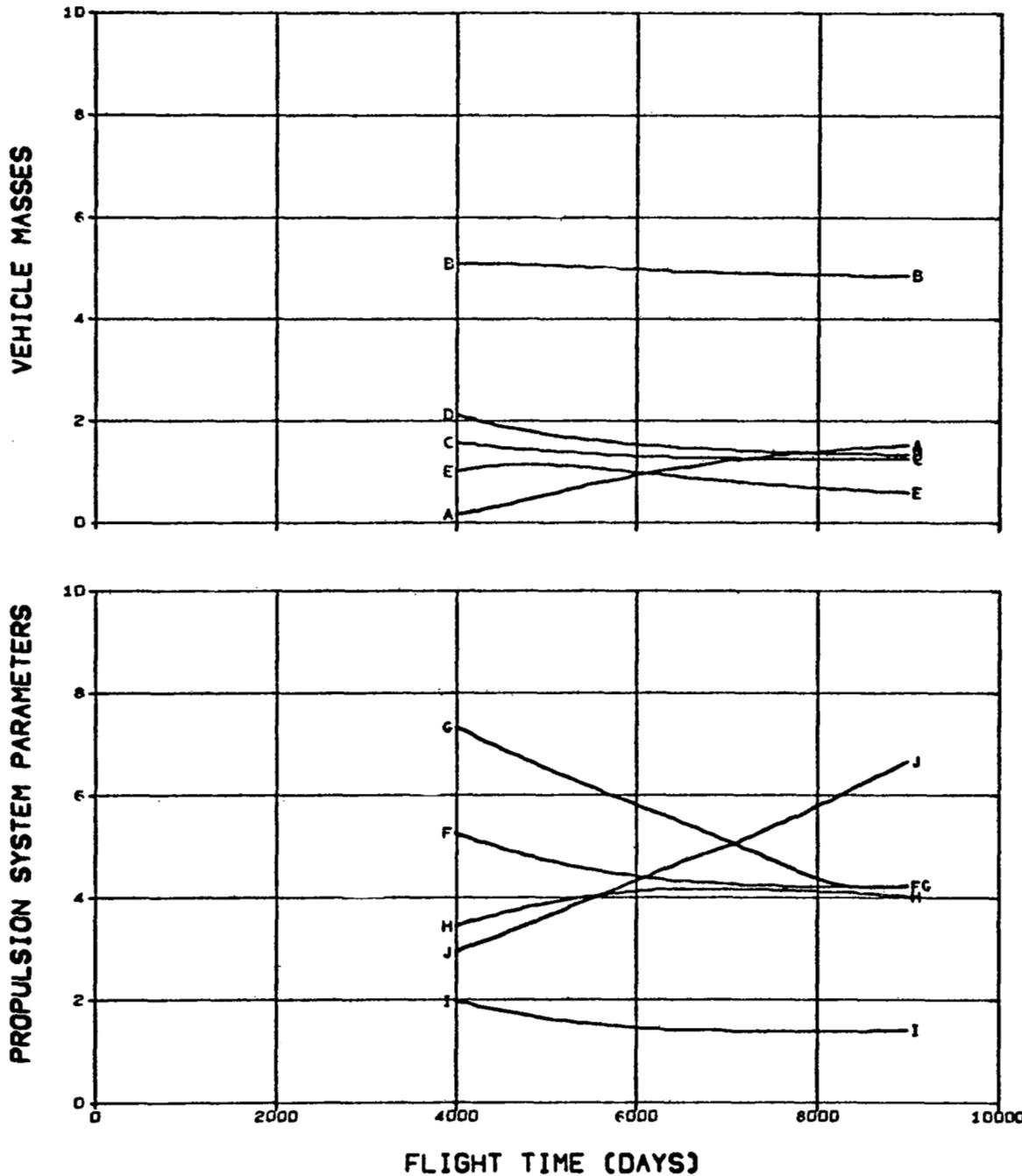


FIG. 8.6.2 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/1000	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPULSION SYSTEM MASS (KG)/1000	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/1000	I	THRUST AT 1 AU (N)
E	RETRO PROPELLANT MASS (KG)/1000	J	PROPULSION TIME (DAYS)/1000



**FIG. 8.6.3 NEPTUNE MODE B ORBITER MISSIONS
TITAN III X(1205)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED**

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

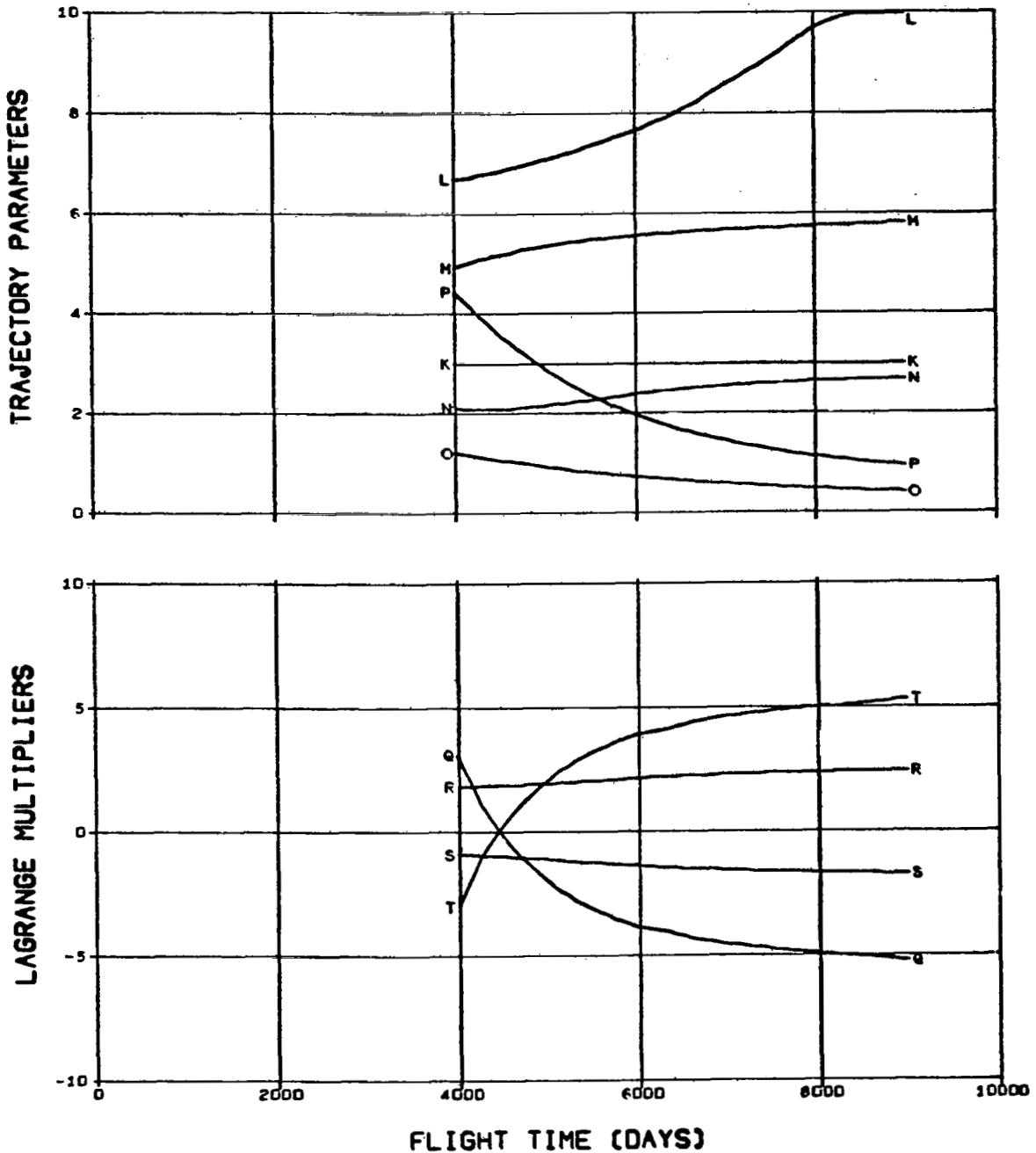


FIG. 8.6.3 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/100000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPELLION TIME (DAYS)/1000

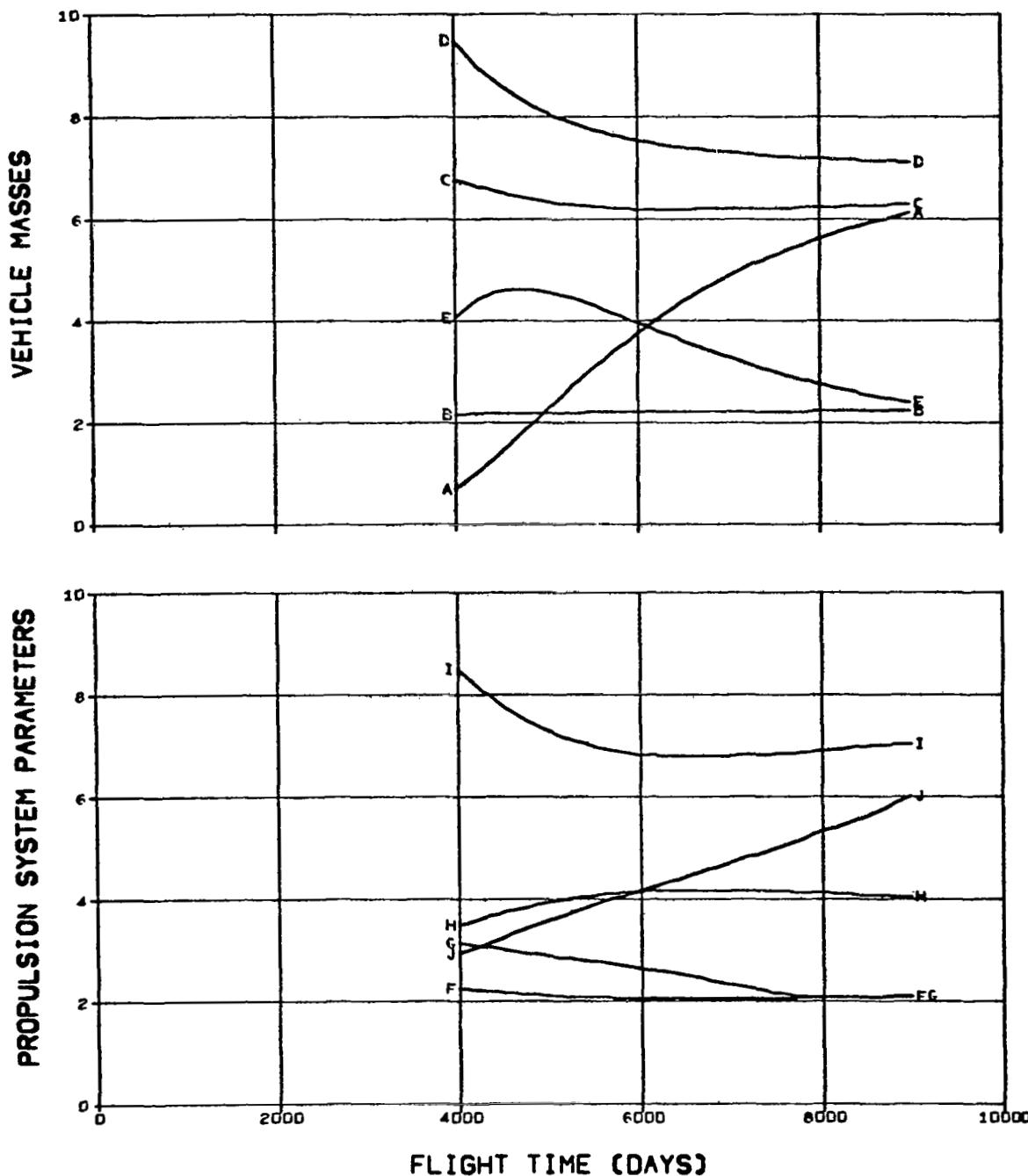


FIG. 8.6.4 NEPTUNE MODE B ORBITER MISSIONS
TITAN III C LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

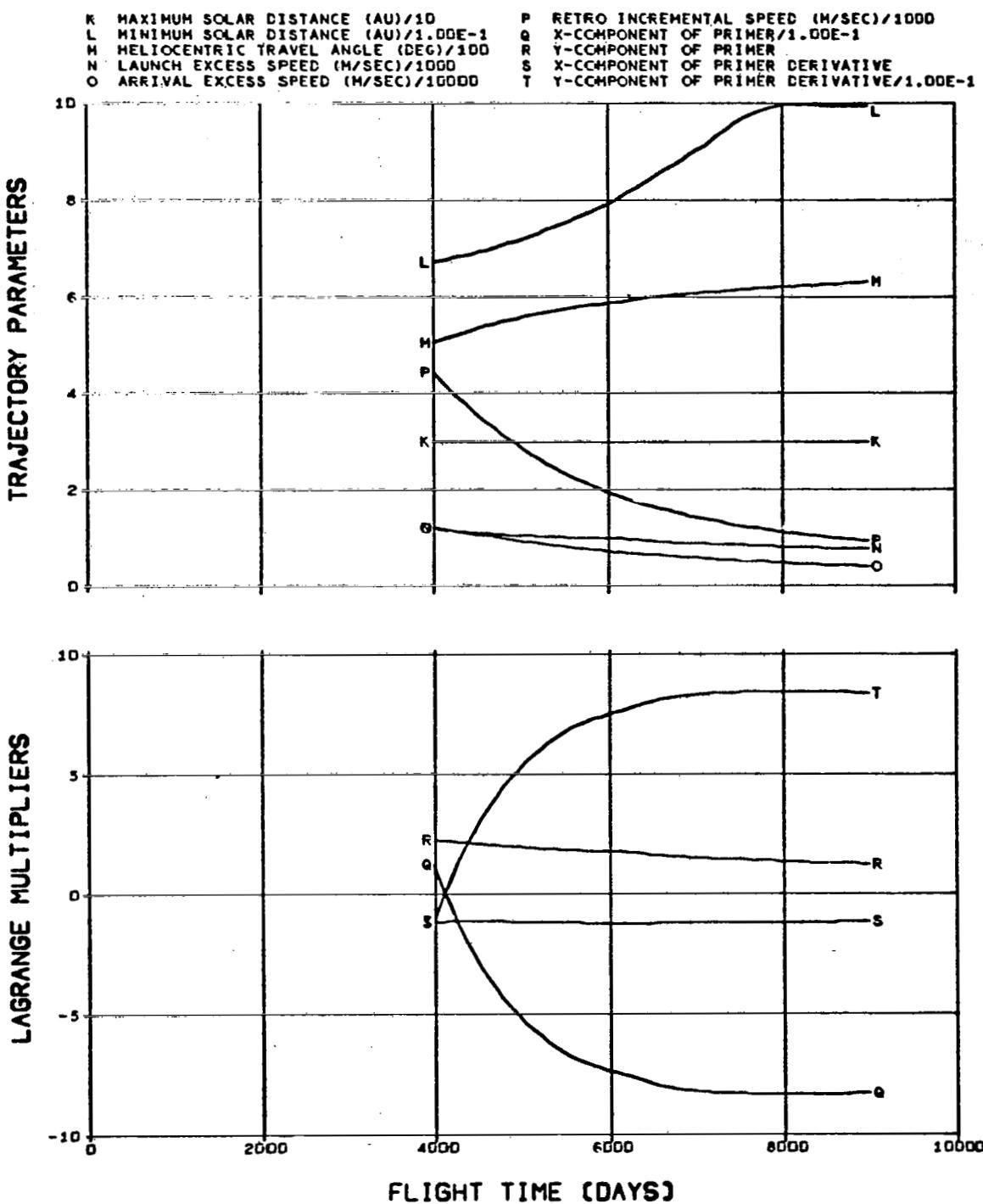


FIG. 8.6.4 (CONCLUDED)

A NET SPACECRAFT MASS (KG)/100
 B INITIAL SPACECRAFT MASS (KG)/1000
 C PROPULSION SYSTEM MASS (KG)/100
 D PROPELLANT MASS (KG)/100
 E RETRO PROPELLANT MASS (KG)/100
 F POWER AT 1 AU (KW)/10
 G MAXIMUM POWER (KW)/10
 H JET EXHAUST SPEED (M/SEC)/10000
 I THRUST AT 1 AU (N)/1.00E-1
 J PROPULSION TIME (DAYS)/1000

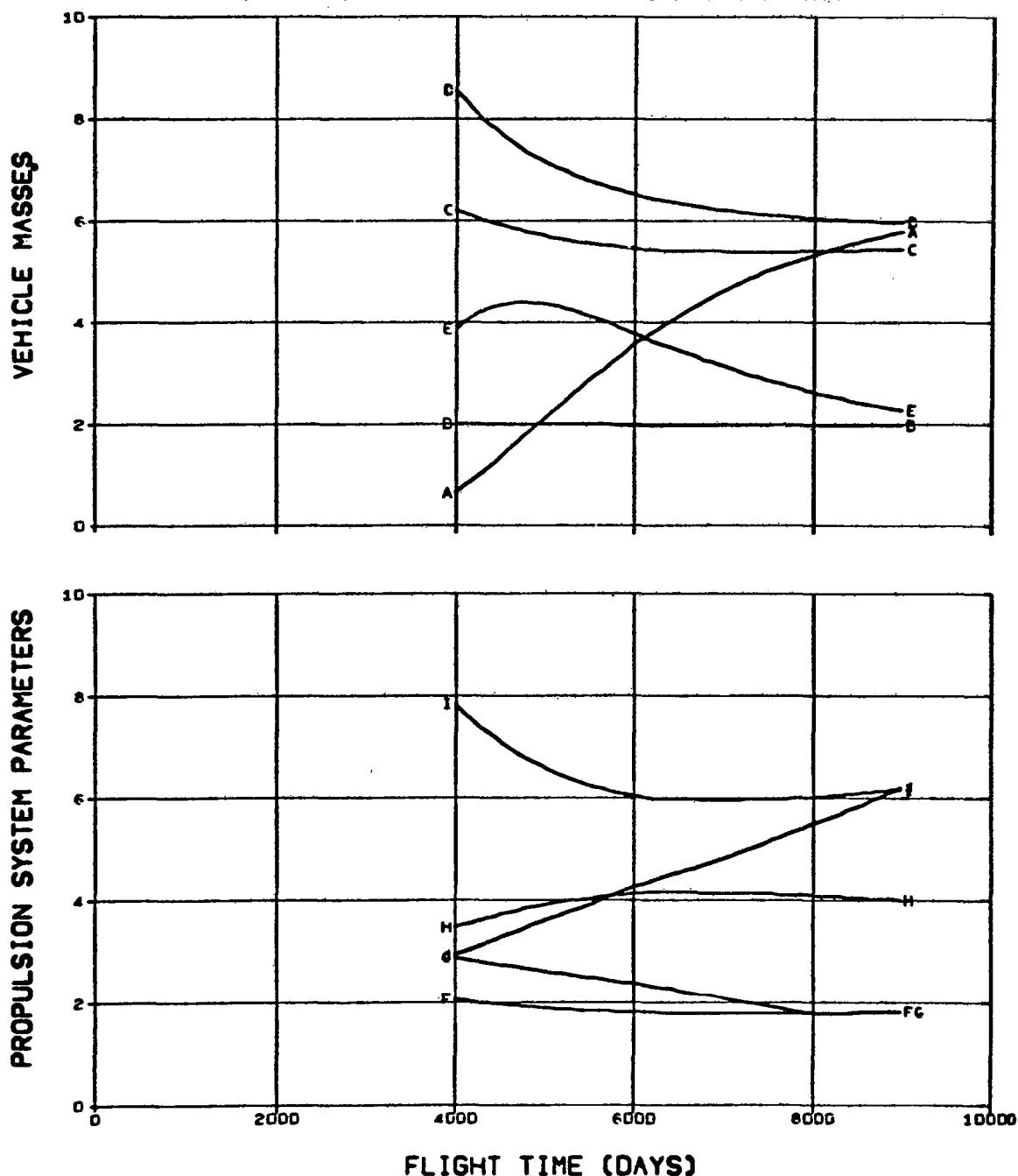


FIG. 8.6.5 NEPTUNE MODE B ORBITER MISSIONS
ATLAS(SLV3X)/CENTAUR LAUNCH VEHICLE
PROPULSION SYSTEM JETTISONED

K MAXIMUM SOLAR DISTANCE (AU)/10
 L MINIMUM SOLAR DISTANCE (AU)/1.0DE-1
 M HELIOCENTRIC TRAVEL ANGLE (DEG)/100
 N LAUNCH EXCESS SPEED (M/SEC)/1000
 O ARRIVAL EXCESS SPEED (M/SEC)/10000
 P RETRO INCREMENTAL SPEED (M/SEC)/1000
 Q X-COMPONENT OF PRIMER/1.0DE-1
 R Y-COMPONENT OF PRIMER
 S X-COMPONENT OF PRIMER DERIVATIVE
 T Y-COMPONENT OF PRIMER DERIVATIVE/1.0DE-1

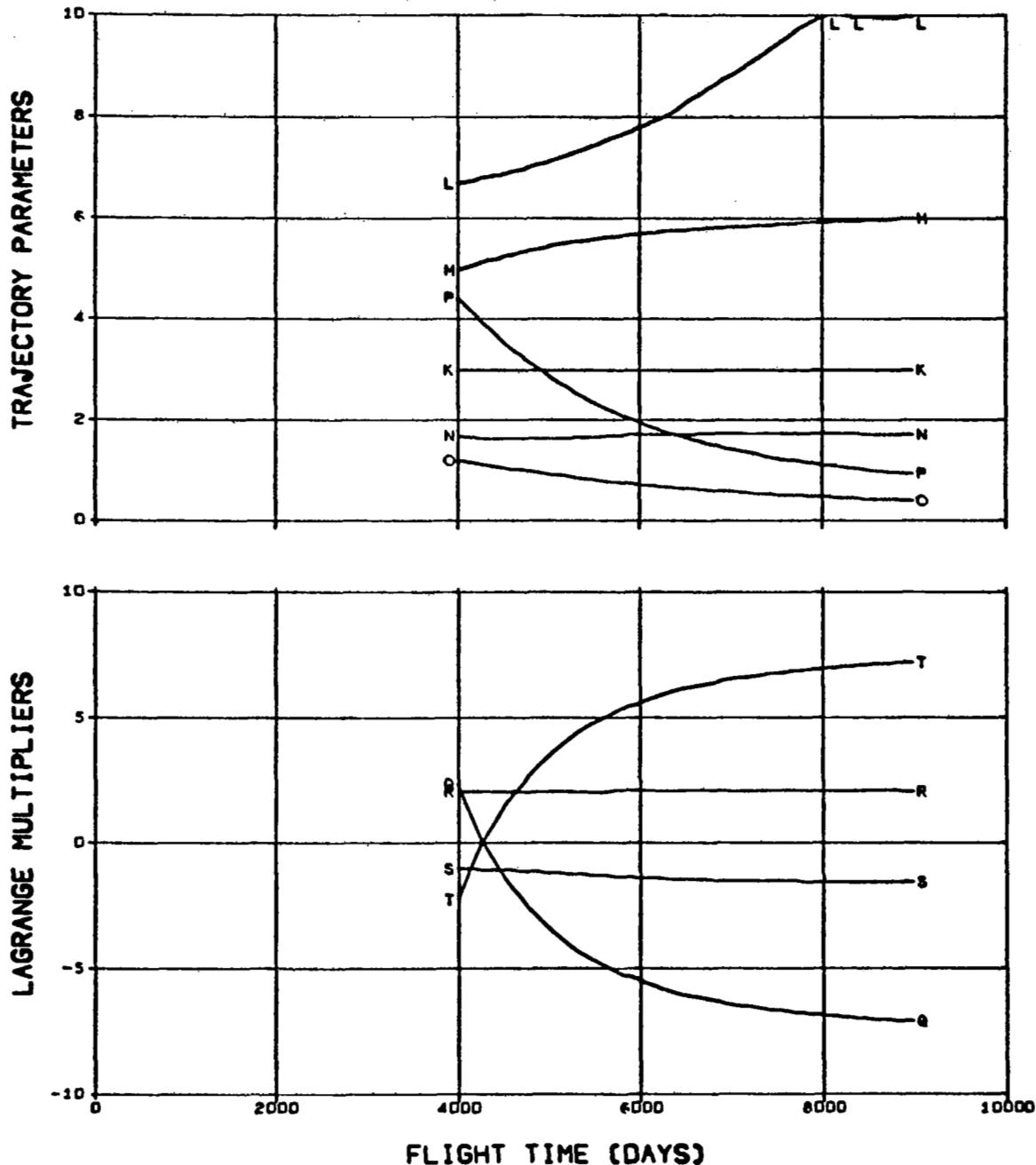


FIG. 8.6.5 (CONCLUDED)

A	NET SPACECRAFT MASS (KG)/100	F	POWER AT 1 AU (KW)/10
B	INITIAL SPACECRAFT MASS (KG)/1000	G	MAXIMUM POWER (KW)/10
C	PROPELLUTION SYSTEM MASS (KG)/100	H	JET EXHAUST SPEED (M/SEC)/10000
D	PROPELLANT MASS (KG)/100	I	THRUST AT 1 AU (N)/1.00E-1
E	RETRO PROPELLANT MASS (KG)/100	J	PROPULSION TIME (DAYS)/1000

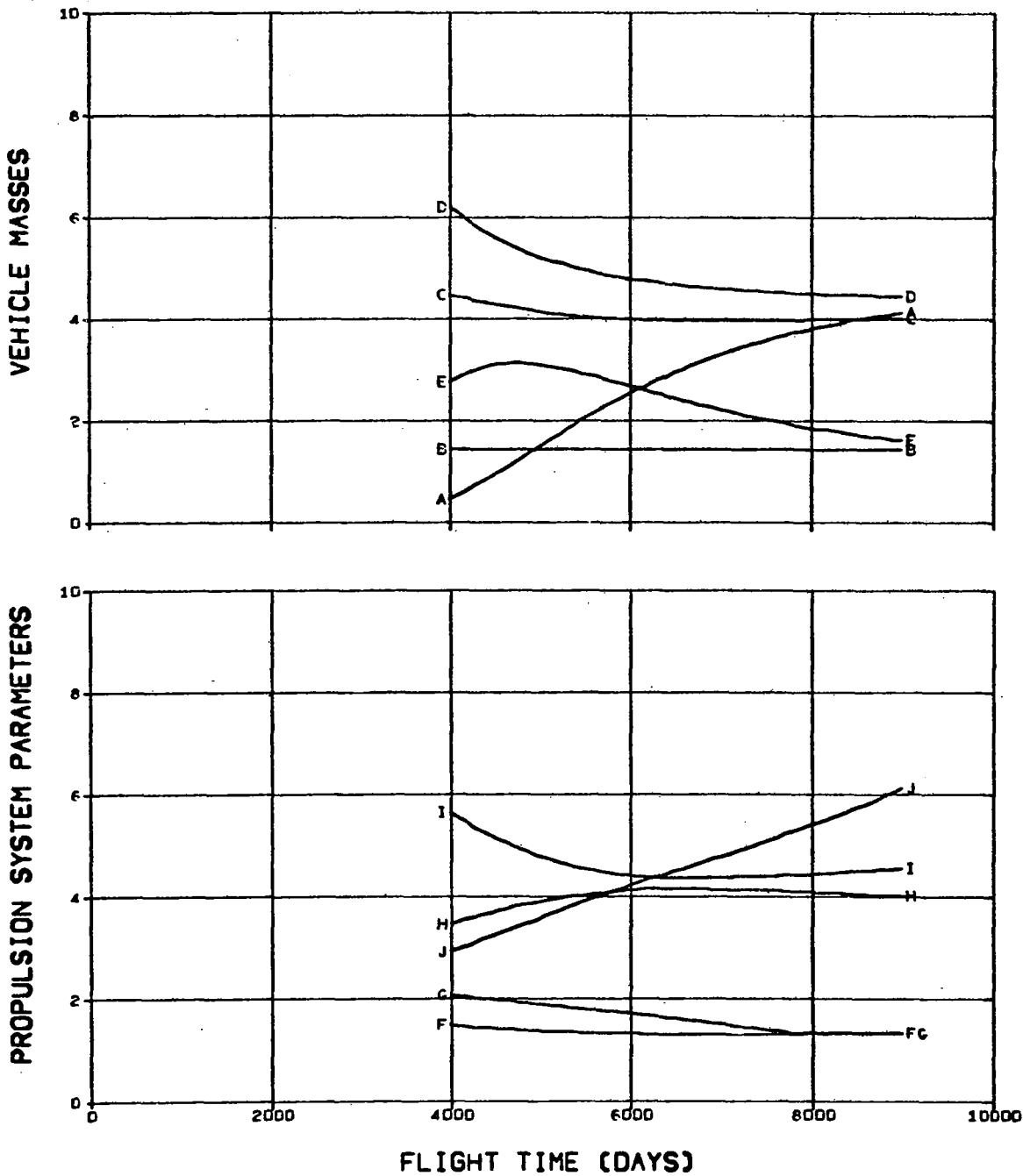


FIG. 8.6.6 NEPTUNE MODE B ORBITER MISSIONS
TITAN III X/CENTAUR LAUNCH VEHICLE
PROPELLUTION SYSTEM JETTISONED

K . MAXIMUM SOLAR DISTANCE (AU)/10 P . RETRO INCREMENTAL SPEED (M/SEC)/1000
 L . MINIMUM SOLAR DISTANCE (AU)/1.00E-1 Q . X-COMPONENT OF PRIMER/1.00E-1
 M . HELIOCENTRIC TRAVEL ANGLE (DEG)/100 R . Y-COMPONENT OF PRIMER
 N . LAUNCH EXCESS SPEED (M/SEC)/1000 S . X-COMPONENT OF PRIMER DERIVATIVE
 O . ARRIVAL EXCESS SPEED (M/SEC)/10000 T . Y-COMPONENT OF PRIMER DERIVATIVE/1.00E-1

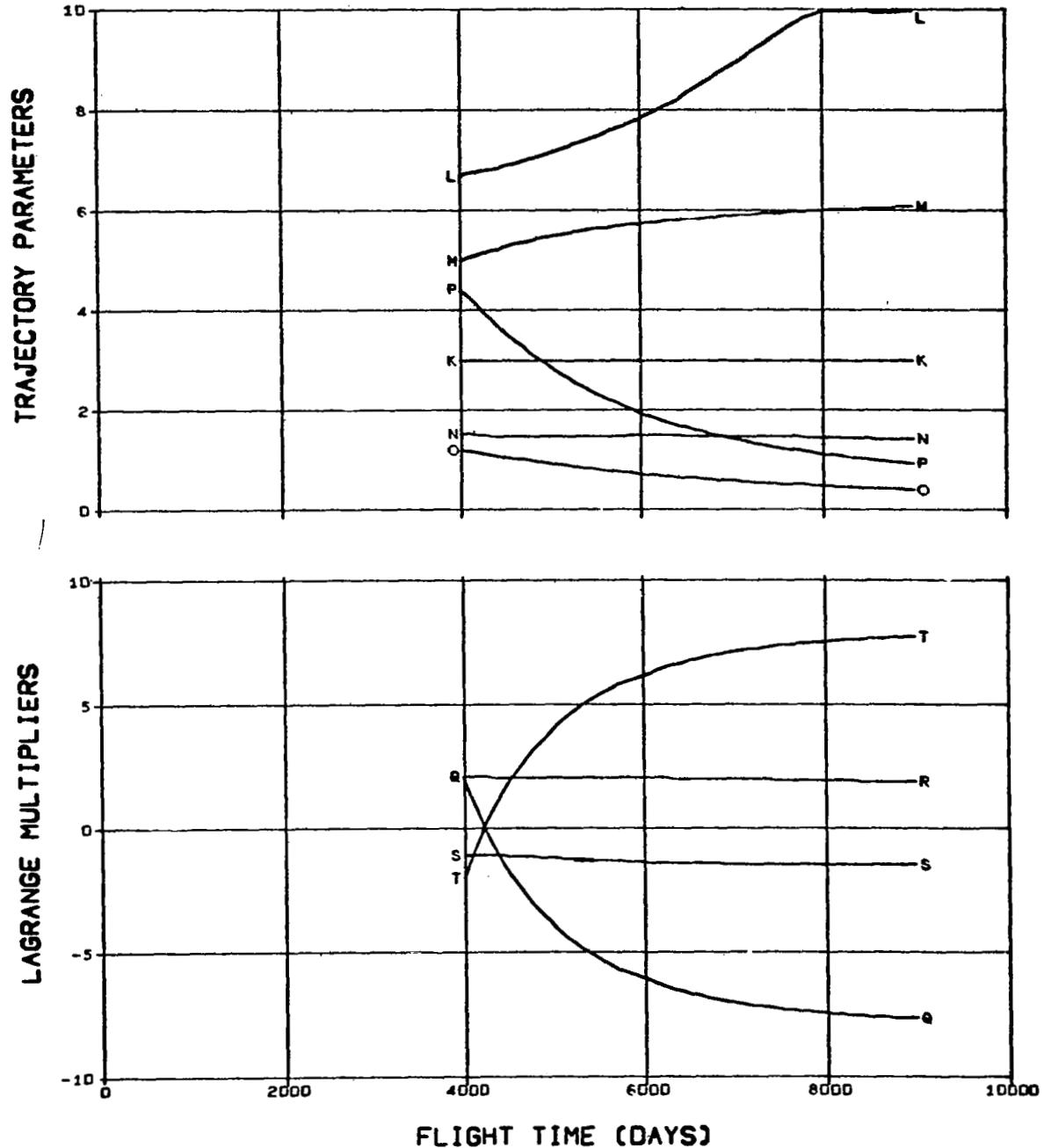


FIG. 8.6.6 (CONCLUDED)